CASE STUDY PROBLEM-SOLVING MATRICES

The 11 case study problem-solving matrices provided on the following pages link the problems identified with the Level I Ergonomics Assessment Checklist and Checklist Scoring Summary to strategies or options which you may use to control ergonomics hazards. The matrices and the pages on which they appear are presented in Table 1 below.

Table 1
Directory of Case Study Problem-Solving Matrices

CASE STUDY - 1 Using a Computer/General Word Processing		
TASK TITLE: Keying/Typing		**TASK TITLE: Mousing**
Task Description:		**Task Description:**
Typing and keying may involve the use of a computer keyboard or electronic typewriter. The types of keyboards on which this case study is based is that of a Qwerty layout; conventional rectangular design. The length of time keying varies significantly for keying/typing tasks as well as the type of work that is typically performed. Information used for keying/typing may come from a hard copy, Dictaphone, or telephone. Typical jobs in which keying is performed include (not necessarily limited to): • heavy data entry • customer service/record keeping • general administrative support		Mousing involves the use of a standard-shaped mouse. The mouse fits into the palm and is activated by either two or three buttons. Mousing can also be performed on a laptop with the use of a small button or track ball. Mousing is used to point and click on an object on the screen, scroll on a series of lines, or draw. The length of time mousing varies significantly for mousing tasks as well as the type of work that is typically performed. Information used for mousing typically comes from a hard copy. Typical jobs in which mousing is performed include: • desktop publishing • technician/administrative tasks
Job Performance Measures Most often impacted by Using a Computer:	Error rates; number of records/documents processed.	
Typical Employee Comments about Using a Computer:	Employees most often comment on their concern over the repetitive nature of the keying, and/or mousing tasks. A great deal of media attention is given to keying and this seems to bring the employee's attention here. For both keying and mousing, employees typically complain about discomfort and/or stiffness in the hands/wrists, arms, shoulders/neck, and head/eyes.	
Suggested Level II Analysis:	Postural analysis, light level analysis.	

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Keyboard too high  **Figure 1.1**	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse;	✓		low	low	low
		• Note: in some cases, a footrest will be required in order to support the person's feet.	✓		low	low	low
		30. Lower keyboard tray or work surface: • set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard.	✓		low to med	low	med
	• Chair positioned too far away	33. Move chair closer to worksurface.	✓		low	low	low
	• Arms of chair interfere with moving chair closer.  **Figure 1.2**	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med	low	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med to high	low	low

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Lack of a place to rest the hands.  **Figure 1.3**	36. Move keyboard forward so forearms rest evenly on surface: • if worksurface is deep enough, this is simply a matter of pushing the keyboard back on the worksurface;	✓		low	low	low
		• if the worksurface depth is restricted, providing this space would require using a different worksurface for computer work.		✓	med	low	low
	• Lack of leg clearance under desk.	89. Remove clutter from under work surface.	✓		low	low	med
	• Mouse positioned too high.  **Figure 1.4**	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the mouse;	✓		low	low	low
		• Note: in some cases, a footrest will be required in order to support the person's feet.	✓		low	low	low
		30. Lower keyboard tray or work surface: • set the height of the mouse support surface so that the person's elbows are at the same height as the mouse.	✓	✓	low to med	low	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Mouse not positioned next to keyboard.  **Figure 1.5**	63. Position mouse next to keyboard: • provide a worksurface that allows the mouse and keyboard to be placed side by side and at the same height; • position mouse and keyboard so the forearm can be rested on the worksurface while keying and mousing.	✓	✓	low to med	low	low
	• Keyboard tray used with mouse placed on desk.  **Figure 1.6**	17. Install larger keyboard tray: • replace the current keyboard tray with a tray which accommodates a mouse/input and a keyboard.		✓	med	low	med
		49. Place keyboard and mouse on work surface: • provide a worksurface which is large enough to support a keyboard and mouse.		✓	med	low	med
	• Items used frequently not positioned close to the body.	35. Move item in work zone: items which are used every few minutes or more should be placed close to the body	✓		low	low	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Repeated reaching	• Reaching for items too far from body.  **Figure 1.7**	35. Move items in work zone.	✓		low	low	med
3. Shrugging: working with the shoulders shrugged	• Keyboard too high	30. Lower keyboard tray or work surface: set the height of the work surface so that the person's elbows are at the same height as the keyboard.	✓		low to med	low	med
	• Chair positioned too low	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • Note: in some cases, a footrest will be required in order to support the person's feet.	✓		low	low	low
	• Drawer under work surface restricts chair height	71 Provide alternative work surface: • remove drawer; • provide a workstation with no obstructions under the worksurface such as pencil drawers or structural brackets.	✓	✓	med	low	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person has tendency to tense the shoulders while working	23. Incorporate health comfort strategies: • encourage the person to relax while working – breath frequently – alternate tasks – stretch – take rest pauses	✓		low	low	med
		95. Train proper body mechanics/posture: • encourage the person to let the shoulders drop down and relax while keying.	✓		low	low	med
4. Repeated arm Forces	• Rarely occurs	N/A					
5. Holding/ carrying materials	• Rarely occurs	N/A					
6. Cradling the telephone between the neck and shoulder	• Talking on the telephone (using a handset) while both hands are occupied (e.g., keying or doing paper work)	83. Provide telephone headset: • provide a selection of head set types to choose from (e.g., over-the-head, over-the-ear).		✓	med	med	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		101. Use an available telephone headset	✓		low	med	med
	• Monitor positioned too low  **Figure 1.8**	59. Position monitor just below eye level: • raise the monitor; • monitor should be positioned such that the top of the screen is between 0-4" (0-10.16 cm) below eye height; • use a monitor riser, CPU/hard drive, or other stable surface to position monitor at the correct height	✓		low	low	med
	• Monitor positioned too high  **Figure 1.9**	59. Position monitor just below eye level: • lower the monitor; • monitor should be positioned such that the top of the screen is between 0-4" (0-10.16 cm) below eye height; • use a monitor riser, CPU/hard drive, or other stable surface to position monitor at the correct height	✓	✓	low low	low low	low low

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7. Head Bent down, up, or neck twisted	• Monitor and keyboard not aligned  **Figure 1.10**	61. Position monitor in front of body: • position monitor so that it is directly behind the keyboard; • this allows the body to be in alignment and prevents twisting of the neck;	✓		low	med	med
		provide a worksurface that is deep enough to support the keyboard and the monitor screen. For large monitors, this indicates a worksurface which is at least 30" (76.2 cm) deep;		✓	med to high	med	med
		77. Provide a worksurface that is large enough for computer and paper tasks; Caution: while keyboard trays and monitor support arms can be used in some situations, they often have unwanted side effects.		✓	med to high	med	med
	• Monitor greater than 30" (76.2 cm) from eye causes the person to lean forward to read monitor	34. Move items closer to body: • position monitor between 18" and 30" (76.2 cm) from eyes; • 22"-24" (55.88 - 60.96 cm) is a good distance for many people.	✓		low	med to high	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Uncorrected visual disorders cause the person to lean forward to read monitor or documents.	6. Check eyes and correct for visual disorders: • encourage person to have visual disorders corrected.	✓		med to high	med to high	high
	• Individual wears bifocals.	6. Check eyes and correct for visual disorders: • provide monofocal or tri-focal computer glasses.		✓	med to high	med	med
		59. Position monitor directly on the work surface: • for bifocal users, place monitor directly on the work surface or a bit higher so that the head is upright not tilted back (caution: make sure that this does not cause glare problems. If it does, computer glasses are a better solution).		✓	low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Keyboard/typewriter too high • Worksurface too high. • Keyboard is above elbow height	30. Lower work surface/keyboard tray: • if the worksurface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • this is the preferred strategy because it doesn't require a foot rest.	✓		low to high	low	med
		85. Raise chair: set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • This strategy is best when the worksurface is not easily adjustable in height.	✓		low	low	low
		• Note: in some cases, a footrest will be required in order to support the person's feet.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Keyboard/typewriter too low. • Keyboard is below elbow height when chair height is adjusted so that the person's feet are flat on the floor	87. Raise keyboard or work surface: • if the worksurface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • if the worksurface is not adjustable in height, try raising the entire workstation with risers. This works best for free standing furniture but often does not work for modular furniture; • this is the preferred strategy because it doesn't require a foot rest.	✓		low	low	med
	• Keyboard is sloped towards the person.	49. Place keyboard and mouse on worksurface: • lower the feet on the back of the keyboard; • adjust the keyboard support surface so the keyboard is flat and level.	✓		low	low	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person rests wrists on front edge of the keyboard or the work surface immediately in front of the keyboard	96. Train proper keying style: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying ; • encourage person to avoid bending the wrists while resting the hands.	✓		low	med	med
		18. Install palm rest: • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture.	✓		low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person constantly rests wrists on the wrist rest while keying	96. Train proper keying style: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying; • encourage person to use an arm movement to move around on the keyboard rather than a wrist movement; • encourage person to avoid bending the wrists while resting the hands when not keying; • rest hands in lap or on arm rests while pausing.	✓		low	med	med
		18. Install palm rest: • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; • generally, a palm rest which is approximately the same height as the keys will achieve this.		✓	low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Leaning forward while keying or using the mouse	95. Train proper body mechanics: • encourage person to rest the back against the back rest while keying or using the mouse; • this reduces the tendency to bend the wrists back while keying or using the mouse.	✓		low	med	med
	• Position of mouse in relation to keyboard	107. Use keyboard tray that accommodates mouse, keyboard, and palm support.	✓		low to med	med	med
	• Mouse is too far away from body  **Figure 1.11**	63. Position mouse next to keyboard: • position the mouse directly adjacent to the keyboard and at approximately the same height as the keyboard; • position mouse and keyboard so the forearm can be rested on the worksurface while keying and mousing.	✓		low	low	low
	• Using wrist movement to move mouse rather than arm movement	95. Train proper body mechanics posture: • encourage person to use a forearm movement to move the mouse rather than a wrist movement.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. Repeated wrist movements	• Rarely occurs	N/A					
10. Repeated finger movements	• Keying/typing speed	67. Program macro keys to reduce keying: • macros are small programs that can be useful for highly repetitive keying or mousing actions.	✓		low	high	high
		95. Train proper body mechanics posture: • encourage the person to avoid rushing.	✓		low	low	low
	• Length of task without a work break	13. Incorporate health comfort strategies: • alternate tasks; • stretch; • take rest pause.	✓		low	med	med
		88. Redesign job: • adjust job activities to distribute keying activities throughout the day; • break up continuous keying and mousing tasks with other types of tasks.	✓	✓	low to med	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
11. Hyper-extension of finger/thumb	• Small input device (e.g., track ball, glide point) requires single finger activation	15. Install alternative mouse • provide a full-size input device such as a mouse or large track-ball		✓	low to high		med
	• Person has tendency to hyperextend fingers or thumbs while keying.	98. Train proper mousing style: • encourage person to avoid extending fingers while mousing or keying; • encourage person to keep all of the fingers curled under and together.	✓		low	low	low
12. Hand forces	• Person tends to hit keys hard	96. Train proper keying style: • encourage person to practice using as light a touch as possible on keys and buttons.	✓		low	low	low
	• Person tends to place a heavy grip on mouse or click mouse buttons hard	98. Train proper mousing style: • encourage person to practice keeping a light grip on the mouse.	✓		low	low	low
	• Keys are stiff	22. Investigate use of alternative keyboard: • provide a keyboard with keys which do not require excessive forces to actuate; keys should provide adequate auditory and tactile feedback when actuated.		✓	med to high	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Mouse buttons are stiff.	15. Install alternative mouse: • provide a mouse with buttons which do not require excessive forces to actuate.		✓	med to high	med	med
	• Lack of appropriate tactile feedback (“click”).	22. Investigate use of alternative keyboard: • keys should provide adequate auditory and tactile feedback when actuated. 15. Install alternative mouse: • mouse buttons should provide adequate auditory and tactile feedback when actuated.		✓	low to high	med	med

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Hard edges	• Wrists rest on edge of work surface. (See Figures 1.12 and 1.13) **Figure 1.12**  **Figure 1.13** 	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse. • In some cases, a footrest will be required in order to support the person's feet .	✓		low	low	low
		30. Lower keyboard tray or work surface: • set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard.	✓		low to med	low	med
		36. Move keyboard forward so forearms rest evenly on surface: • reduces the tendency to rest the wrists/forearms on the hard edge;	✓		low	low	low
		• if the worksurface depth is restricted, providing this space would require using a different worksurface for computer work.		✓	med	low	low

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		18. Install palm rest: • the hard edge can be eliminated by attaching a rounded edge to the front edge of the worksurface. This option is generally preferred over the use of a palm rest; • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; • a palm rest is not recommended for a mouse because it results in awkward wrist movements.	✓		low	med	med
	• Work surface is not deep enough to provide a place to rest the hands in front of the keyboard	107. Use keyboard tray that accommodates mouse, keyboard, and palm support.		✓	high	med	med
		77. Provide larger work surface.		✓	med to high	med	med
	• Hard arm rests	94. Train worker to properly adjust chair: • attach padding to the armrests to eliminate exposure to hard edges.	✓		low	low	low
		78. Provide proper chair • provide a chair with padded armrests		✓	med	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. Repeated forearm rotation	• Rarely occurs	N/A					
15. Leaning forward or poor lower back posture	• Monitor too far from eyes	58. Position monitor 18" - 30" (33.02-76.02) from the eyes; is a good distance for many people.	✓		low	med	med
	• Text is difficult to read	12. Improve character size and style on document and monitor: • increase font size of text; • font size of at least 12 point is recommended for screen distances of 18"-30" (33.02-76.02 cm); • font sizes of greater than 12 point are recommended for screen distances greater than 30" (76.02 cm).	✓		low	med	med
	• Person has the unconscious habit of leaning forward while working	95. Train proper body mechanics: • encourage person to rest the back against back rest and sit back and relax while working; encourage person to push his or her chair toward the workstation in order to reduce the tendency to lean forward.	✓		low	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Inappropriate chair adjustment	94. Train worker to properly adjust chair: • adjust back rest to support lower back; • pull chair forward and lean back while working; • attach a small pillow to back rest to support lower back.	✓		low	med	med
	• Inadequate chair	78. Provide proper chair: • provide a chair with a back rest; • provide a chair with adequate lower back support.		✓	med to high	med	med
	• Chair arms interfere with moving chair closer	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med	med	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med to high	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Seat pan on chair is too deep.	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		low to med	med	med
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med
	• Inadequate foot support causes person to not lean against back rest. • Chair too high discourages person from leaning against back rest	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported;	✓		low to med	low	low
		• a box or several ring binders taped securely together can also be used;		✓	low to med	low	low
		• a footrest of one height may not be appropriate for all sized individuals or workstations (footrests with several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of 16” x 20” (40.64 X 50.8 cm) is recommended).					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
16. Repeated bending	• Reaching for items too far from body  **Figure 1.14**	35. Move items in work zone.	✓		low	med	med
17. Lifting forces	• Rarely occurs	N/A					
18. No foot support	• Chair too high.	28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Feet are unsupported	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests with several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64cm X 50.8 cm) is recommended).	✓		low to med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or worksurface presses into legs	• Feet are not supported	76. Provide footrest: • a footrest can support the feet and simultaneously reduce pressure on the back of the leg; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests with several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64cm X 50.8cm) s recommended).  **Figure 1.15**	✓		low to med	low	low

Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Seat pan has a hard front edge	94. Train worker to properly adjust chair: • provide a cushion for the seat pan to prevent contact with hard edge.	✓		med	low	low
		78. Provide proper chair: • provide a chair with a rounded front edge on the seat pan.		✓	med to high	low	low
	• Seat pan too long	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		med	low	low
		provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med

Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Obstructions under worksurface interfere with leg clearance and expose person to hard edges – pencil drawers – keyboard trays – or structural supports	89. Remove clutter from under work surface: • eliminate obstructions; • remove pencil drawers; • replace problem keyboard trays with trays that do not expose person to hard edges.	✓		low to high	med	med
20. Hard floor surfaces	• Rarely occurs	N/A					
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Length of work task without a change of position for the eyes	46. Periodically look away from screen.	✓		low	low	low
		13. Incorporate health comfort strategies: • alternate tasks; • stretch; • take rest pauses.	✓		low	low	low
23. Glare	• Glare directly from a light source: looking towards an uncovered window • Glare from an uncovered window reflected off monitor or other shiny surfaces  **Figure 1.16**	53. Place the monitor perpendicular to the window.	✓		low to med	med	med
		8. Close blinds or curtains • provide window coverings if not available.	✓		low	low	low

Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Task light shines into eyes  **Figure 1.18**	9. Cover or turn out under-cabinet lighting: • cover the task light to prevent it from shining into eyes. 40. Move monitor out from under-cabinet lighting. 10. Direct task light away from screen and eyes: • if necessary, provide a more easily adjustable task light.	✓ ✓ ✓		low low low low	low low med low	low low med low

Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
24. Light levels	• Light levels too high around monitor • Light level too low to read document	31. Lower light levels: • turn off task light; • 20-50 fc is an appropriate range of light levels for computer tasks; • remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the assistance of appropriate technical assistance and the agreement of co-workers in the area; • provide alternative light fixtures for overhead lights (parabolic louvre fixtures are recommended when computer work is the pre-dominant activity.) Note: this should also be performed by the appropriate personnel; • if light levels for the monitor are adjusted appropriately, it may still be necessary to increase light levels for paper tasks using a task light/desk lamp.	✓	✓	med to high	med	med

Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		82. Provide task light: • provide task light (50-100 fc is an appropriate range of light levels for reading tasks); • increase overall light levels to meet the lighting needs of computer and paper tasks (50 fc is an appropriate light level where both computer and paper tasks are performed).	✓	✓	low to med	med	med
25. Screen Distance	• Monitor positioned too close to eyes	58. Position monitor 18" -30" (45.72 -76.2 cm) from the eyes: • 22"-24" (55.88-60.96 cm) is a good distance for many people.	✓		low	med	med
	• Not enough work surface space to position monitor far enough away from person	52. Place monitor on alternative work surface.		✓	med	med	med
	• Monitor positioned too far from eyes	58. Position monitor 18"-30" (45.72-76.2 cm) from the eyes: • 22"-24" (55.88-60.96 cm) is a good distance for many people.	✓		low	med	med

Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Uncorrected visual disorders	6. Check eyes and correct for visual disorders and provide computer glasses for person's who need bifocals. Provide monofocal or tri-focal computer glasses.		✓	med to high	med	med
26. Difficult to read	• Font/character size too small to read on computer screen	12. Improve character size and style on document and monitor: • increase font size of text; • font size of at least 12 point are recommended for screen distances of 18"-30" (45.72-76.2 cm); • font sizes of greater than 12 point are recommended for screen distances of greater than 30" (76.2 cm).	✓		low	med	med
	• Document text too small	12. Improve character size and style on document and monitor: • increase font size of text; • font size of at least 12 point are recommended for screen distances of 18"-30" (45.72-76.2 cm); font sizes of greater than 12 point are recommended for screen distances of greater than 30" (76.2cm).	✓		low	med	med

Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Document text hand written hard to read	12. Improve character size and style on document and monitor: • increase character size.		✓	low to high	med	med
	• VDT screen dirty.	7. Clean screen regularly.	✓		low	med	med

CASE STUDY - 2 Writing/Illustrating	
TASK TITLE: Writing/Illustrating	
Task Description:	**Writing and illustrating** may involve the pen, pencil, or felt pen. The diameter of the pen/pencil/felt pen can vary in diameter from ¼" (.635 cm) to 1" (2.54 cm). The length of time writing or illustrating varies significantly as well as the type of work that is typically performed. Writing and illustrating can be performed on a flat surface or an angled/height-adjustable drafting table. Typical jobs in which writing and illustrating is performed include: • desktop publishing • customer service/record keeping contracts
Job Performance Measures Most often impacted by Writing/Illustrating:	Error rates, number of records/documents processed
Typical Employee Comments about Writing/Illustrating:	Employees typically complain about discomfort and/or stiffness in the hands/wrists, arms, and shoulders/neck.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Holding up pages of a multi-page reference document  **Figure 2.1**	57. Position document on document support: • provide a mechanical holder for pages; • separate pages in document so that pages can be viewed one at a time; • investigate electronic storage of documents.	✓ ✓	 ✓	low to med. low high	low low med.	med. med. med.
	• Person reaches to write on document which is too far away on work surface • Person does not rest the hand while writing	35. Move item in work zone: • move the document closer to the edge of the work surface; • items which are used every few minutes or more should be placed close to the body.	✓		low	med.	med.
		18. Install palm rest: • provide a place for the person to rest the hand while writing; • encourage the person to rest the hand while writing.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Chair positioned too far away	33. Move chair closer to surface edge.	✓		low	low	low
	• Arms of chair interfere with moving chair closer  **Figure 2.2**	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓	✓	low to med.	med.	med.
		78. Provide proper chair in which the armrests can be adjusted or removed.		✓	med. to high	med.	med.
	• Lack of leg clearance under desk	89. Remove clutter from under work surface.	✓		low	med.	med.
	• Items used frequently not positioned close to the body	35. Move item in work zone: • items which are used every few minutes or more should be placed close to the body.	✓		low	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Repeated reaching	• Turning pages repeatedly • Moving documents repeatedly	57. Position document on document support: • provide a mechanical holder for pages;	✓		low to med.	low	med.
		• separate pages in document so that pages can be viewed one at a time;	✓		low	low	med.
		• investigate electronic storage of documents.		✓	high	med.	med.
		35. Documents requiring frequent page turning should be in the primary work zone; that is, it should not require a reach in order to turn the pages.	✓		low	med.	med.
	• Items used frequently not positioned close to the body	34. Move items closer to body: • prioritize the location of items on the workstation according to frequency of use; • those items which are more frequently used should be closer to the body and more easily accessible.	✓		low	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Too many documents or too much paperwork on the desk at one time	36. Move items closer to body: • prioritize the location of items according to frequency of use; • those items which are not used frequently should filed or otherwise removed from the work surface to increase space for more frequently used items.	✓		low	med.	med.
	• Inadequate work space • Work surface inadequate space to support materials for required tasks	77. Provide a larger work surface: • provide a work surface which has adequate space for required tasks; • provide an auxiliary work surface; • go to a different area, which has a larger work surface for performing space intensive tasks; • increase the size of the existing work surface.		✓	med. to high	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Chair positioned too low	85. Raise chair: • set the height of the chair so that the work surface is about half way between resting elbow height and shoulder height; • Note: in some cases, a footrest will be required in order to support the person's feet.	✓		low	low	low
3. Shrugging: working with the shoulders shrugged	• Rarely occurs	N/A					
4. Repeated arm forces	• Rarely occurs	N/A					
5. Holding/ carrying materials	• Rarely occurs	N/A					
6. Cradling the telephone between the neck and shoulders	• Rarely occurs	N/A					
7. Head Bent down, up, or neck twisted	• Reference document positioned flat on work surface (see Figure 2.5)	4. Angle work surface to bring work closer to the body and the eye: • if document is manipulated frequently or written on, an	✓		med.	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	 **Figure 2.5**	inclined work surface is preferred; • the inclined surface should be able to be moved easily and, preferably, adjustable in incline; • the inclined surface needs a stop at the bottom to hold papers; • the inclined surface can be a purchased accessory or it can be made by taping several empty 3-ring binders together and taping a clip board or a piece of card board at the bottom to hold papers.					
	• Document is too far away or is too far to the side	34. Move items closer to body: • prioritize the location of items on the workstation according to frequency of use; • those items which are more frequently used should be closer to the body and more easily accessible.	✓		low	med.	med.
	• Text is difficult to read	12. Improve character size and style on document and monitor: • increase size of text on hard	✓		low	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		copy; • improve clarity of text on hard copy.					
	• Uncorrected visual disorders cause the person to lean forward to read monitor or documents	6. Check eyes and correct for visual disorders and encourage person to have visual disorders corrected.		✓	med. to high	med.	med.
	• Light levels too low	82. Provide task light: • increase light levels on documents being read; • light levels of between 50-100 fc are recommended for reading and writing tasks; • an adjustable task light (i.e., desk lamp) can help direct more light to the appropriate documents.		✓	low to med.	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Chair too high	28. Lower chair: • set the height of the chair so that the work surface is about half way between resting elbow height and shoulder height.	✓		low	low	med.
	• Work surface too low	86. Raise desk: • set the height of the document support surface so that the work surface is about half way between resting elbow height and shoulder height.	✓	✓	low	low	med.

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Angle and position of work surface/document used for writing (see Figure 2.6)  **Figure 2.6**	4. Angle work surface to bring work closer to the body and the eye: • if document is handled, flipped or written on, an inclined work surface is preferred; • the inclined surface should be able to be moved easily and, preferably, adjustable in incline; • the inclined surface needs a stop at the bottom to hold papers; • the inclined surface can be a purchased accessory or it can be made by taping several empty 3-ring binders together and taping a clip board or a piece or card board at the bottom to hold the papers.	✓		low	low	med.
9. Repeated wrist movements		34. Move items closer to body: • prioritize the location of items on the workstation according to frequency of use; • those items which are more frequently used should be closer to the body and more easily accessible.	✓		low	low	med.

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		44. Orient paper by turning it so that the area worked on is close to the body and a straight wrist is maintained while writing.	✓		low	low	low
	• Person rests wrists on front edge of large book or binder that is used for writing	95. Train proper body mechanics posture: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying ; • encourage person to avoid bending the wrists while resting the hands.	✓		low	low	low
		18. Install palm rest: • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; • a palm rest is only necessary if there is not another comfortable place to rest the hands without having to bend the wrists.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Repeated finger movements	• Writing speed and length of task • Length of task without a work break	95. Train proper body mechanics posture and encourage the person to avoid rushing.	✓		low	med.	med.
		13. Incorporate health comfort strategies: – alternate tasks; – stretch; – take rest pauses.	✓		low	low	low
		88. Redesign job: • adjust job activities to distribute keying activities throughout the day; • break up continuous keying and mousing tasks with other types of tasks.		✓	low to med.	med.	med.
11. Hyper-extension of finger/thumb	• Rarely occurs	N/A					
12. Hand forces	• Gripping the pen/pencil too hard	96. Train proper body mechanics; encourage person to practice using as light a grip as possible on the pen or pencil.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		2. Alternate grips for pen to help reduce gripping force: • attach a compressible grip surface to pens/pencils to reduce forces required to hold pen/pencil	✓		low	low	low
13. Hard edges	• Wrists rest on edge of work surface or 3-ring binder (see Figure 2.7)  **Figure 2.7**	18. Install palm rest: • the hard edge can be eliminated by attaching a rounded edge to the front edge of the work surface. This option is generally preferred over the use of a palm rest; • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; • a palm rest is only necessary if there is not another comfortable place to rest the hands without having to bend the wrists.	✓	✓	low to med.	low low	low low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Hard arm rests	94. Train worker to properly adjust chair: • attach padding to the armrests to eliminate exposure to hard edges.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		78. Provide proper chair: • provide a chair with padded armrests.		✓	med to high	low	low
14. Repeated forearm rotation	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward or poor lower back posture	• Document positioned flat on work surface	4. Angle work surface to bring work closer to the body and the eye: • if document is handled, flipped or written on, an inclined work surface is preferred; • the inclined surface should be able to be moved easily and, preferably, adjustable in incline; • the inclined surface needs a stop at the bottom to hold papers; • the inclined surface can be a purchased accessory or it can be made by taping several empty 3-ring binders together and taping a clip board or a piece or card board at the bottom to hold the papers.	✓		med	med	med
	• Documents too far away or too far to the side	35. Move item closer to body: • position documents so they can be read easily without leaning forward; • prioritize the location of items on the workstation according to frequency of use.	✓		low	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Text is difficult to read	12. Improve character size and style on document and monitor: • increase size of text on hard copy; • improve clarity of text on hard copy.	✓		low	med	med
	• Uncorrected visual disorders cause the person to lean forward to read monitor or documents	6. Check eyes and correct for visual disorder: • encourage person to have visual disorders corrected.		✓	med to high	med	med
	• Light levels too low	82. Provide task light: • increase light levels on documents being read; • light levels of between 50-100 fc are recommended for reading and writing tasks; • an adjustable task light (i.e., desk lamp) can help direct more light to the appropriate documents.		✓	low to med	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Chair too high	28. Lower chair: • set the height of the chair so that the work surface is about half way between resting elbow height and shoulder height.	✓		low	low	med
	• Work surface too low	86. Raise desk: • set the height of the document support surface so that the work surface is about half way between resting elbow height and shoulder height.	✓	✓	low	low	med
	• Person has a habit of leaning forward while working.	95. Train worker on proper body mechanics: • encourage person to rest the back against back rest and sit back and relax while working; • encourage person to push his or her chair toward the workstation in order to reduce the tendency to lean forward.	✓		low	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Inappropriate chair adjustment	94. Train worker to properly adjust chair: • adjust back rest to support lower back; • attach a small pillow to back rest to support lower back.	✓		low	med	med
	• Inadequate chair	78. Provide proper chair: • provide a chair with a back rest; • provide a chair with adequate lower back support.		✓	med to high	med	med
	• Chair arms interfere with moving chair closer	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med	med	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med to high	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Seat pan on chair is too deep	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		low	med	med
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med
	• Inadequate foot support causes person to not lean against back rest. • Chair too high causes person not lean against back rest.	81. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item ; • a box or several ring binders taped securely together can also be used; • A footrest of one height may not be appropriate for all sized individuals or workstations (footrests which come in several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of 16” x 20” (40.64 cm X 50.8 cm) is recommended).	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms;	✓		low	low	low
16. Repeated bending	• Reaching for items too far from body (See Figure 2.8)  **Figure 2.8**	35. Move item closer to body: • position documents so they can be read easily without leaning forward; • prioritize the location of items on the workstation according to frequency of use.	✓		low	med	med
17. Lifting forces	• Rarely occurs	N/A					
18. No foot support	• Chair too high	28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Feet are unsupported	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests which come in several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64 cm X 50.8 cm) is recommended).	✓		low to med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or worksurface presses into legs	• Feet are not supported	76. Provide footrest: • a footrest can support the feet and simultaneously reduce pressure on the back of the leg; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrest footrests which come in several heights or which are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16” x 20” (40.64 cm X 50.8 cm) is recommended).  **Figure 2.9**	✓		low to med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28 Lower chair: • adjust the chair height so that the person's heels and toes rest comfortably on the floor or other foot rest; • insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Seat pan has a hard front edge	94. Train worker to properly adjust chair: • provide a cushion for the seat pan to prevent contact with hard edge.	✓		low to med	low	low
		78. Provide proper chair. • provide a chair with a rounded front edge on the seat pan.		✓	med to high	med	med
	• Seat pan too long	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;		✓	med	low	low
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Obstructions under worksurface interfere with leg clearance and expose person to hard edges: – pencil drawers – keyboard trays – or structural supports	89. Remove clutter from under work surface: • eliminate obstructions; • remove pencil drawers; • replace problem keyboard trays with trays that do not expose person to hard edges.	✓	✓	low to med	med	med
20. Hard floor surfaces	• Rarely occurs	N/A					
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Length of work task without a change of position for the eyes.	46. Periodically look away from screen/document.	✓		low	med	med
		13. Incorporate health comfort strategies: – alternate tasks – stretch – take rest pauses	✓		low	med	med
23. Glare	• Glare directly from a light source (e.g., looking towards an uncovered window) • Glare from an uncovered window reflected off surfaces	8. Close blinds or curtains: • provide window coverings if not available.	✓	✓	low	med	med
	• Task light shines into eyes (See Figure 2.10)	9. Cover or turn out under-cabinet lighting:					
		• cover the task light to prevent it from shining into eyes; and,	✓		low	med	med
		• replace under-cabinet lighting with an adjustable desk lamp.		✓	low to med	med	med
		40. Move monitor out from under-cabinet lighting.	✓		low to med	med	med

Figure 2.10

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
24. Light levels	• Light level too low to read document	82 Provide task light: • provide task light (50-100 fc is an appropriate range of light levels for reading tasks); • increase overall light levels to meet the lighting needs of computer and paper tasks (50 fc is an appropriate light level where both computer and paper tasks are performed).		✓	low to med	med	med
25. Screen distance	• Rarely occurs	N/A					
26. Difficult to read	• Document text too small • Document text hand written hard to read	12. Improve character size and style on document and monitor: • increase size of text on hard copy; • improve clarity of text on hard copy.	✓		low	med	med

CASE STUDY - 3 Stapling	
TASK TITLE: Stapling	
Task Description:	**Stapling** may involve the use of a hand-held stapler or a desk-top stapler for stacks of paper. Stapling may involve removing staples with a staple remover, sorting paper, straightening the stack, and stapling the stack. The length of time stapling varies significantly for stapling tasks. (Note: Some of the controls suggested in this case study may also apply to hole punching.) Typical jobs in which stapling is performed include: • copying and sorting • customer service
Job Performance Measures Most often impacted by Stapling:	Error rates, number of documents processed
Typical Employee Comments about Stapling:	Employees typically complain about discomfort and/or stiffness in the hands/wrists, arms, back/torso, and shoulders/neck.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Stapler too far from body	42. Move stapler closer to work-surface edge: • when the stapler is being used with high frequency, it should be positioned close to the edge of the work surface.	✓		low	med.	med.
	• Work surface too high • Chair too low	30. Lower work surface: • set the height of the work surface so that the person's elbows are at the same height as the stapler.	✓		low to med.	low	low
		85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the stapler; • in some cases, a footrest will be required in order to support the person's feet.	✓		low	low	low
	• Chair positioned too far away	33. Move chair closer to work surface: • encourage person to push his or her chair toward the workstation in order to reduce the tendency to reach or lean forward.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Arms of chair interfere with moving chair closer  **Figure 3.1**	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med.	low	med.
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med.	low	low
	• Lack of leg clearance under desk	89. Remove clutter from under work surface.	✓		low	low	med.
2. Repeated reaching	• Stapler too far from body	42. Move stapler closer to work-surface edge. • while the stapler is being used with high frequency, it should be positioned close to the edge of the work surface.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Items used frequently not positioned close to the body  **Figure 3.2**	34. Move items closer to body: • prioritize the location of items on the workstation according to frequency of use; • frequently used items should be positioned closer to the body and easily accessible.	✓		low	med. to high	med.
3. Shrugging; working with the shoulders shrugged	• Work surface too high	30. Lower work surface: • set the height of the work surface so that the person's elbows are at the same height as the stapler.	✓		low to med.	low	low
	• Chair positioned too low	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the stapler; • Note: in some cases, a footrest will be required in order to support the person's feet.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Drawer under work surface restricts chair height	71 Provide alternative work surface: • remove drawer; • provide a workstation with no obstructions under the work surface such as pencil drawers or structural brackets.	✓		med.	low	med.
4. Repeated arm forces	• Rarely occurs	N/A					
5. Holding/ carrying materials	• Rarely occurs	N/A					
6. Cradling the telephone between the neck and shoulder	• Rarely occurs	N/A					
7. Head bent down, up, or neck twisted	• Rarely occurs	N/A					

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Work surface too high  **Figure 3.3**	30. Lower work surface: • set the height of the work surface so that the person's elbows are at the same height as the stapler. 85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the stapler; • in some cases, a footrest will be required in order to support the person's feet.	✓ ✓		low to med. low	low low	low low
9. Repeated wrist movements	• Length and repetition of task without a work break	13. Incorporate health comfort strategies: • alternate tasks; • stretch; and • take rest pauses.	✓		low	med.	med.
10. Repeated finger movements	• Rarely occurs	N/A					
11. Hyper-extension of finger/thumb	• Rarely occurs	N/A					

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Hand forces	• Stapler requires substantial hand forces • High volume stapling	102. Provide automatic stapler: • for high volume stapling tasks, provide a stapler which does not require high hand forces.		✓	med. to high	med.	med.
		108. Use larger stapler with longer lever arm: • a larger stapler may reduce the force required to actuate the stapler.	✓		low	med.	med.
13. Hard edges	• Hard edge on front of stapler	18. Install palm rest: • attach compressible padding to the top of the stapler to eliminate exposure to hard edges.	✓		low	med.	med.
		102. Provide automatic stapler: • for high volume stapling tasks, provide a stapler which does not require exposure to hard edges.		✓	med. to high	med.	med.

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. Repeated forearm rotation	• Turning pages • Manipulating documents	13. Incorporate health comfort strategies: • alternate tasks; • stretch; • take rest pauses.	✓		low	med.	med.
		34. Move items closer to body: • prioritize position of items on the workstation according to frequency of use; • those items used frequently should be closer to the body and easily accessible.	✓		low	med. to high	med.
		88. Redesign job: • computerize some portion of the documents to reduce excessive document handling.		✓	low to med.	med.	med.

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward or poor lower back posture	• Documents too far away or too far to the side	35. Move item closer to body: • position documents so they can be read easily without leaning forward; • prioritize the location of items on the workstation according to frequency of use.	✓		low	low	med.
	• Light levels too low	82. Provide task light: • increase light levels on documents being handled; • light levels of between 50-100 fc are recommended for paper tasks; • an adjustable task light (i.e., desk lamp) can help direct more light to the appropriate documents.	✓		low to med.	med.	med.
	• Chair too high	28. Lower chair: • set the height of the chair so that the work surface is about half way between resting elbow height and shoulder height.	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Work surface too low	86. Raise desk: • set the height of the document support surface so that the work surface is about half way between resting elbow height and shoulder height.	✓		low	low	low
	• Person has the unconscious habit of leaning forward while working	95. Train proper body mechanics: • encourage person to rest the back against back rest and sit back and relax while working; • encourage person to push his or her chair toward the workstation in order to reduce the tendency to lean forward.	✓		low	low	med.
	• Inappropriate chair adjustment	94. Train worker to properly adjust chair: • adjust back rest to support lower back; • pull chair forward and lean back while working; • attach a small pillow to back rest to support lower back.	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Inadequate chair	78. Provide proper chair: • provide a chair with a back rest; • provide a chair with adequate lower back support.		✓	med.	low	low
	• Chair arms interfere with moving chair closer	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med.	low	med.
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med.	low	low
	• Seat pan on chair is too deep	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		low to med.	med.	med.
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Inadequate foot support causes person to not lean against back rest • Chair too high causes person not lean against back rest	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item; • a box or several ring binders taped securely together can also be used; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights or are adjustable in height are preferred); and • a footrest should be large enough to allow the feet to move freely (size of 16” x 20” (40.64 cm X 50.8 cm) is recommended). 28. Lower chair: • adjust the chair height so that the person’s heels and toes can both rest comfortably on the floor or other foot rest;	✓ ✓		low to med. low	low low	low low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		• care must be given to ensure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.					
16. Repeated bending	• Reaching and bending to use the stapler • Reaching for items too far from body	42. Move stapler closer to work-surface edge: • while the stapler is being used with high frequency, it should be positioned close to the edge of the work surface. 35. Move item closer to body: • position documents so they can be read easily without leaning forward; • prioritize the location of items on the workstation according to frequency of use.	✓ ✓		low low	low low	low med.
17. Lifting forces	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
18. No foot support	• Chair too high	28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Feet are unsupported	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within come in several heights or are adjustable in height are preferred); and • a footrest should be large enough to allow the feet to move freely (size of at least 16" x 20" (40.64 cm X 50.8 cm) is recommended).	✓		low to med.	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or work surface presses into legs	• Feet are not supported	76. Provide footrest: • a footrest can support the feet and simultaneously reduce pressure on the back of the leg.  **Figure 3.4**	✓		low to med.	low	low
		28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Seat pan has a hard front edge	94. Train worker to properly adjust chair: • provide a cushion for the seat pan to prevent contact with hard edge.	✓		low	low	low
		78. Provide proper chair: • provide a chair with a rounded front edge on the seat pan.		✓	med.	low	low
	• Seat pan too long	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		low to med.	med.	med.
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med
	• Obstructions under work surface interfere with leg clearance and expose person to hard edges: – pencil drawers; – keyboard trays; – or structural supports.	89. Remove clutter from under work surface: • eliminate obstructions; • remove pencil drawers; • replace problem keyboard trays with trays that do not expose person to hard edges.	✓		low	low	med.

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
20. Hard floor surfaces	• Rarely occurs	N/A					
21. Kneeling/ squatting	• Rarely occurs	N/A					
22. Staring at screen or document	• Rarely occurs	N/A					
23. Glare	• Rarely occurs	N/A					
24. Light levels	• Rarely occurs	N/A					
25. Screen distance	• Rarely occurs	N/A					
26. Difficult to read	• Rarely occurs	N/A					

CASE STUDY - 4 Monitoring Visual Display (Vigilance)	
TASK TITLE: Monitoring	
Task Description:	Monitoring involves the use of a monitor or series of monitors, keyboard (conventional), mouse (conventional) and a telephone. The length of time spent monitoring varies significantly for monitoring tasks as well as the type of work which is typically performed. Information used for the task typically comes from the monitor. Periodically required information will come from systems manuals. Typical jobs in which monitoring is performed include: • weather station • radar control
Job Performance Measures Most often impacted by Monitoring:	Error rates
Typical Employee Comments about Monitoring:	Employees typically complain about discomfort and/or stiffness in the hands/wrists, arms, shoulders/neck, and head/eyes.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Keyboard too high.  **Figure 4.1**	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • a footrest may be required to support the person's feet.	✓		low	low	low
		30. Lower keyboard tray or work surface: set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard.	✓		low to med.	low	med.
	• Chair positioned too far away	33. Move chair closer to work surface.	✓		low	low	low
	• Arms of chair prohibit moving chair closer to desk  **Figure 4.2**	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med.	low	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Lack of a place to rest the hands  **Figure 4.3**	36. Move keyboard forward so forearms rest evenly on surface: • if work surface is deep enough, this is simply a matter of pushing the keyboard back on the work surface;	✓		low	low	low
		• if the work surface depth is restricted, providing this space would require using a different work surface for computer work.		✓	med.	low	low
	• Lack of leg clearance under desk	89. Remove clutter from under work surface.	✓		low	low	med.
	• Mouse positioned too high  **Figure 4.4**	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the mouse; • a footrest may be required to support the person's feet.	✓		low	low	low
		30. Lower keyboard tray or work surface: • set the height of the mouse support surface so that the person's elbows are at the same height as the mouse.	✓	✓	low to med.	low	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Mouse not positioned next to keyboard  **Figure 4.5**	63. Position mouse next to keyboard: • provide a work surface that allows the mouse and keyboard to be placed side by side and at the same height; • position mouse and keyboard so the forearm can be rested on the work surface while keying and mousing.	✓		low to med.	low	low
	• Keyboard tray used with mouse placed on desk  **Figure 4.6**	17. Install larger keyboard tray: • replace the current keyboard tray with a tray which accommodates a mouse/input device and a keyboard.		✓	med.	low	med.
		49. Place keyboard and mouse on work surface: • provide a work surface which is large enough to support a keyboard and mouse.		✓	med.	low	med.
	• Items used frequently not positioned close to the body	35. Move item in work zone: • items which are used every few minutes or more should be placed close to the body.	✓		low	low	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Repeated reaching	• Reaching for items too far from body  **Figure 4.7**	35. Move items in work zone.	✓		low	low	med.
3. Shrugging: working with the shoulders shrugged	• Keyboard too high	30. Lower keyboard tray or work surface: • set the height of the work surface so that the person's elbows are at the same height as the keyboard.	✓	✓	low to med.	low	med.
	• Chair positioned too low	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • Note: in some cases, a footrest will be required in order to support the person's feet.	✓		low	low	low
	• Drawer under work surface restricts chair height	71 Provide alternative work surface: • remove drawer; provide a workstation without obstructions under the work surface (e.g., pencil drawers or structural brackets).	✓	✓	med.	low	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person has tendency to tense the shoulders while working	23. Incorporate health comfort strategies: • encourage the person to relax while working – breath frequently – alternate tasks – stretch – take rest pauses	✓		low	low	med.
		95. Train proper body mechanics/posture: • encourage the person to let the shoulders down and relax while keying.	✓		low	low	med.
4. Repeated arm forces	• Rarely occurs	N/A					
5. Holding/ carrying materials	• Rarely occurs	N/A					
6. Cradling the telephone between the neck and shoulder	• Talking on the telephone (using a hand set) while both hands are occupied (e.g., keying or doing paper work)	83. Provide telephone headset: • provide a selection of head set types to choose from (e.g., over-the-head, over-the-ear).		✓	med.	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		101. Use an available telephone headset.	✓		low	med.	med.
	• Monitor positioned too low  **Figure 4.8**	59. Position monitor just below eye level: • raise the monitor; • monitor should be positioned such that the top of the screen is between 0-4" (0-10.16 cm) below eye height; • use a monitor riser, CPU/hard drive, or other stable surface to position monitor at the correct height.	✓		low	low	med.
	• Monitor positioned too high  **Figure 4.9**	59. Position monitor just below eye level: • lower the monitor; • monitor should be positioned such that the top of the screen is between 0-4" (0-10.16 cm) below eye height; • use a monitor riser, CPU/hard drive, or other stable surface to position monitor at the correct height.	✓		low	low	low
				✓	low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7. Head Bent down, up, or neck twisted	• Monitor and keyboard not aligned  **Figure 4.10**	61. Position monitor in front of body: position monitor so that it is directly behind the keyboard (this allows the body to be in alignment and prevents twisting of the neck); • provide a work surface that is deep enough to support the keyboard and the monitor screen. For large monitors, this indicates a work surface which is at least 30" (76.2 cm) deep; • provide a work surface that is large enough for computer and paper tasks; • use of keyboard trays and monitor support arms can be used in some situations, however, they often have unwanted side effects.	✓		low	med.	med.
				✓	med. to high	med.	med.
	• Monitor greater than 30" inches from eye causes the person to lean forward to read monitor	34. Move items closer to body: • position monitor between 18 and 30" (45.72cm - 76.2cm) from eyes; • 22"-24" (55.88cm - 60.96cm) is a good distance for many people.	✓		low	med. to high	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Uncorrected visual disorders cause the person to lean forward to read monitor or documents	6. Check eyes and correct for visual disorders: • encourage person to have visual disorders corrected.	✓		med. to high	med. to high	high
	• Individual wears bifocals	6. Check eyes and correct for visual disorders: • provide monofocal or tri-focal computer glasses.		✓	med. to high	med.	med.
		59. Position monitor directly on the work surface: • for bifocal users, place monitor directly on the work surface or a bit higher so that the head is upright not tilted back (ensure that this does not cause glare problems. If it does, computer glasses may be a better solution).		✓	low	med	med
	• Multiple monitors used.	61. Position monitor in front of body: • prioritize the location of monitors based on importance and frequency of use; • place most important and most frequently used monitors in front of the body.	✓		low	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		59. Position monitor directly on the work surface: • prioritize the location of monitors based on importance and frequency of use; • place most important and most frequently used monitors so the top of the screen is between 0-4" below eye height.		✓	low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Keyboard/typewriter too high • Work surface too high • Keyboard is above elbow height	30. Lower work surface/keyboard tray: • if the work surface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • this is the preferred strategy because it doesn't require a foot rest.	✓	✓	low to high	low	med.
		85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • This strategy is best when the work surface is not easily adjustable in height; • a footrest may be required to support the person's feet.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Keyboard/typewriter too low • Keyboard is below elbow height when chair height is adjusted so that the person's feet are flat on the floor	87. Raise keyboard or work surface: • if the work surface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • if the work surface is not adjustable in height, try raising the entire workstation with risers. This works best for free standing furniture but often does not work for modular furniture; • this is the preferred strategy because it doesn't require a foot rest.	✓	✓	low	low	med.
	• Keyboard is sloped towards the person	49. Place keyboard and mouse on work surface: • lower the feet on the back of the keyboard; • adjust the keyboard support surface so the keyboard is flat and level.	✓		low	low	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person rests wrists on front edge of the keyboard or the work surface immediately in front of the keyboard	96. Train proper keying style: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying ; • encourage person to avoid bending the wrists while resting the hands.	✓		low	med.	med.
		18. Install palm rest: • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture;	✓		low	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person constantly rests wrists on the wrist rest while keying	96. Train proper keying style: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying; • encourage person to use arm movement to move around on the keyboard rather than a wrist movement; • encourage person to avoid bending the wrists while resting the hands; • rest hands in lap or on arm rests while pausing.	✓		low	med.	med.
		18. Install palm rest: • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; • generally, a palm rest which is approximately the same height as the keys will achieve this.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Leaning forward while keying or using the mouse	95. Train proper body mechanics: • encourage person to rest the back against the back rest while keying or using the mouse; • this reduces the tendency to bend the wrists back while keying or using the mouse.	✓		low	med.	med.
	• Position of mouse in relation to keyboard	107. Use keyboard tray that accommodates mouse, keyboard, and palm support.		✓	low to med.	med.	med.
	• Mouse is too far away from body  **Figure 4.11**	63. Position mouse next to keyboard: • position the mouse directly adjacent to the keyboard and at approximately the same height as the keyboard; • position mouse and keyboard so the forearm can be rested on the work surface while keying and mousing.	✓		low	low	low
	• Using wrist movement to move mouse rather than arm movement	95. Train proper body mechanics posture: encourage person to use a forearm movement to move the mouse rather than a wrist movement.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. Repeated wrist movements	• Rarely occurs	N/A					
10. Repeated finger movements	• Keying/typing speed and length of task • Length of task without a work break	67. Program macro keys to reduce keying: • macros are small programs that can be useful for highly repetitive keying or mousing actions.	✓		low	high	high
		95. Train proper body mechanics posture: • encourage the person to avoid rushing.	✓		low	low	low
		13. Incorporate health comfort strategies: • encourage the person to relax while working – breath frequently – alternate tasks – stretch – take rest pause	✓	✓	low to med.	med.	med.
		88. Redesign job: • adjust job activities to distribute keying activities throughout the day; • break up continuous keying and mousing tasks with other types of tasks.	✓		low	med	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
11. Hyper-extension of finger/thumb	• Small input device (e.g., track ball, glide point) requires single finger activation	15. Install alternative mouse: • provide a full-size input device such as a mouse or large track-ball.		✓	low to high	low	med.
	• Person has tendency to hyperextend fingers or thumbs while keying	98. Train proper mousing style: • encourage person to avoid extending fingers while mousing or keying; • encourage person to keep all of the fingers curled under and together.	✓		low	low	low
12. Hand forces	• Person tends to hit keys hard	96. Train proper keying style: • encourage person to practice using as light a touch as possible on keys and buttons.	✓		low	low	low
	• Person tends to place a heavy grip on mouse or click mouse buttons hard	98. Train proper mousing style: • encourage person to practice keeping a light grip on the mouse.	✓		low	low	low
	• Keys are stiff	22. Investigate use of alternative keyboard: • provide a keyboard with keys which do not require excessive forces to actuate; • keys should provide adequate auditory and tactile feedback when actuated.		✓	med. to high	med.	med.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Mouse buttons are stiff	15. Install alternative mouse: • provide a mouse with buttons which do not require excessive forces to actuate.		✓	med. to high	med.	med.
	• Lack of appropriate tactile feedback (“click”)	22. Investigate use of alternative keyboard: • keys should provide adequate auditory and tactile feedback when actuated.		✓	low to high	med.	med.
		15. Install alternative mouse: • mouse buttons should provide adequate auditory and tactile feedback when actuated.		✓	med to high	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Hard edges	• Wrists rest on edge of work surface (See Figures 4.12 and 4.13) **Figure 4.12**  **Figure 4.13** 	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • a footrest may be required to support the person's feet.	✓		low	low	low
		30. Lower keyboard tray or work surface: • set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard.	✓		low to med	low	med
		36. Move keyboard forward so forearms rest evenly on surface: • this reduces the tendency to rest the wrists/forearms on the hard edge;	✓		low	low	low
		• if the work surface depth is restricted, providing this space would require using a different work surface for computer work.		✓	med	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		18. Install palm rest: • the hard edge can be eliminated by attaching a rounded edge to the front edge of the work surface. This option is generally preferred over the use of a palm rest; • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; • a palm rest is not recommended for a mouse because it results in awkward wrist movements.	✓		low	med	med
	• Work surface is not deep enough to provide a place to rest the hands in front of the keyboard	107. Use keyboard tray that accommodates mouse, keyboard, and palm support. 77. Provide larger work surface.		✓	high	med	med
	• Hard arm rests	94. Train worker to properly adjust chair: • attach padding to the armrests to eliminate exposure to hard edges.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		78. Provide proper chair • provide a chair with padded armrests.		✓	med	low	low
14. Repeated forearm rotation	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward or poor lower back posture	• Monitor too far from eyes	58. Position monitor 18” - 30” (45.72-76.chair 2 cm) from the eyes: • 22”-24” (55.88cm - 60.96 cm) is a good distance for many people.	✓		low	med	med
	• Text is difficult to read	12. Improve character sizes and style on document and monitor: • increase font size of text; • font size of at least 12 point are recommended for screen distances of 18”-30” (45.72-76.2 cm); • font sizes of greater than 12 point is recommended for screen distances of greater than 30” (76.2 cm).	✓		low	med	med
	• Person has a habit of leaning forward while working	95. Train proper body mechanics: • encourage person to rest the back against back rest and sit back and relax while working; • encourage person to push his or her chair toward the workstation in order to reduce the tendency to lean forward.	✓		low	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Inappropriate chair adjustment	94. Train worker to properly adjust: • adjust back rest to support lower back; • pull chair forward and lean back while working; • attach a small pillow to back rest to support lower back.	✓		low	med	med
	• Inadequate chair	78. Provide proper chair: • provide a chair with a back rest; • provide a chair with adequate lower back support.		✓	med to high	med	med
	• Chair arms interfere with moving chair closer	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med	med	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med to high	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Seat pan on chair is too deep	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back; • provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.	✓	✓	low to med med to high	med med	med med
	• Inadequate foot support causes person to not lean against back rest • Chair is too high and causes person not lean against back rest	81. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item) ; • a box or several ring binders taped securely together can also be used; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights or are adjustable in height are preferred); a footrest should be large enough to allow the feet to move freely (a size of 16” x 20” (40.64 cm X 50.8 cm) is recommended).			low to med	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to ensure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Multiple monitors used	61. Position monitor in front of body: • prioritize the location of monitors based on importance and frequency of use; • place most important and most frequently used monitors in front of the body.	✓		low	med	med
		59. Position monitor directly on the work surface: • prioritize the location of monitors based on importance and frequency of use; • place most important and most frequently used monitors so the top of the screen is between 0-4" (0-10.16 cm) below eye height.	✓		low	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Repeated bending	• Reaching for items too far from body  **Figure 4.14**	35. Move items in work zone.	✓		low	med	med
17. Lifting forces	• Rarely occurs	N/A					
18. No foot support	• Chair too high	28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • ensure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Feet are unsupported.	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized	✓		low to med	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		individuals or workstations (footrests within several heights are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64 cm X 50.8 cm) is recommended).					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or work surface presses into legs	• Feet are not supported	76. Provide footrest: • a footrest can support the feet and simultaneously reduce pressure on the back of the leg; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64 cm X 50.8 cm) is recommended).  **Figure 4.15**	✓		low to med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • ensure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Seat pan has a hard front edge	94. Train worker to properly adjust chair: • provide a cushion for the seat pan to prevent contact with hard edge.	✓		med	low	low
		78. Provide proper chair: • provide a chair with a rounded front edge on the seat pan.		✓	med to high	low	low
	• Seat pan too long	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		med	low	low
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Obstructions under work surface interfere with leg clearance and expose person to hard edges: – pencil drawers; – keyboard trays; – or structural supports.	89. Remove clutter from under work surface: • eliminate obstructions; • remove pencil drawers; • replace problem keyboard trays with trays that do not expose person to hard edges.		✓	low to high	med	med
20. Hard floor surfaces	• Rarely occurs	N/A					
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Length of work task without a change of position for the eyes	46. Periodically look away from screen.	✓		low	low	low
		13. Incorporate health comfort strategies: • encourage the person to relax while working – breath frequently – alternate tasks – stretch – take rest pause	✓		low	low	low
23. Glare	• Glare directly from a light source (e.g., looking towards an uncovered window) • Glare from an uncovered window reflected off monitor or other shiny surfaces  **Figure 4.16**	53. Place the monitor perpendicular to the window.		✓	low to med	med	med
		8. Close blinds or curtains: • provide window coverings if not available.	✓		low	low	low

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Glare directly from a light source: looking towards an overhead light • Glare from an overhead or task light reflected off monitor or other shiny surfaces	60. Position the monitor between rows of overhead lights: • position monitor so that no overhead lights are visible directly above the monitor when looking at the screen; • place the workstation so that it faces a wall or partition.		✓	low to med	med	med
	 **Figure 4.17**	31. Lower light levels: • remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the assistance of appropriate technical assistance and the agreement of co-workers in the area.		✓	low to med	med	med
		20. Install parabolic louvers to direct light down on the surface: • provide alternative light fixtures for overhead lights (parabolic louver fixtures are recommended when computer work is the pre-dominant activity.) Note: this should be performed by the appropriate personnel.		✓	high	med	med
		79. Provide screen hood/visor.	✓		low	med	med
		93. Tilt monitor down so that the					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		screen is vertical.	✓		low	med	med
	• Task light shines into eyes  **Figure 4.18**	9. Cover or turn out under-cabinet lighting: • cover the task light to prevent it from shining into eyes. 40. Move monitor out from under-cabinet lighting. 10. Direct task light away from screen and eyes: • if necessary, provide a more easily adjustable task light.	✓ ✓ ✓ ✓		low low low low	low low med low	low low med low

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
24. Light levels	• Light levels too high around monitor • Light level too low to read document	31. Lower light levels: • turn off task light; • 20-50 fc is an appropriate range of light levels for computer tasks; • remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the assistance of appropriate technical assistance and the agreement of co-workers in the area; • provide alternative light fixtures for overhead lights (parabolic louver fixtures are recommended when computer work is the pre-dominant activity.) Note: this should also be performed by the appropriate personnel; • if light levels for the monitor are adjusted appropriately, it may still be necessary to increase light levels for paper tasks using a task light/desk lamp.	✓	✓	med to high	med	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		82. Provide task light: • provide task light (50-100 fc is an appropriate range of light levels for reading tasks); • increase overall light levels to meet the lighting needs of computer and paper tasks (50 fc is an appropriate light level where both computer and paper tasks are performed).	✓	✓	low to med	med	med
25. Screen Distance	• Monitor positioned too close to eyes	58. Position monitor 18” -30” (45.72-76.2 cm) from the eyes: • 22”-24” (55.88-60.96 cm) is a good distance for many people.	✓		low	med	med
	• Not enough work surface space to position monitor far enough away from person.	52. Place monitor on alternative work surface.		✓	med	med	med
	• Monitor positioned too far from eyes	58. Position monitor 18”-30” (45.72-76.2 cm) from the eyes: • 22”-24” (55.88-60.96 cm) is a good distance for many people.	✓		low	med	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Uncorrected visual disorders	6. Check eyes and correct for visual disorders: • provide computer glasses for person's who need bifocals, provide monofocal or tri-focal computer glasses.		✓	med to high	med	med
26. Difficult to read	• Font/character size too small to read on computer screen	12. Improve character size and style on document and monitor: • increase font size of text; • font size of at least 12 point is recommended for screen distances of 18"-30") (45.72-76.2 cm; • font sizes of greater than 12 point are recommended for screen distances of greater than 30" (76.2 cm).	✓		low	med	med
	• Document text too small	12. Improve character size and style on document and monitor: • increase font size of text; • font size of at least 12 point are recommended for screen distances of 18"-30" (45.72-76.2 cm; • font sizes of greater than 12 point are recommended for screen distances of greater than	✓		low	med	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		30” (76.2 cm).					
	• Document text hand written hard to read	12. Improve character size and style on document and monitor: • increase character size.		✓	low to high	med	med
	• VDT screen dirty	7. Clean screen regularly.	✓		low	med	med

CASE STUDY - 5 Calling (Telephone Use)	
TASK TITLE: Telephone Use	
Task Description:	Telephone use may involve the use of a hand set or a head set. The base of the telephone may be a push button or rotary phone. The length of time of telephone use varies significantly for calling tasks as well as the type of work that is typically performed. Information provided over the telephone may be written out by hand or entered into the computer. Typical jobs in which calling is performed include (not necessarily limited to): • customer service • general administrative support
Job Performance Measures Most often impacted by Calling:	Error rates, number of calls taken and recorded/processed.
Typical Employee Comments about Calling:	Employees typically complain about discomfort and/or stiffness in the shoulders/neck.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Telephone not positioned close to the body (See Figure 5.1) • Person dials frequently  **Figure 5.1**	43. Move telephone in work zone: • move telephone closer to body and into the primary work zone (see work zone specifications, modifications section); • move telephone so reaching is not required to dial the phone or access the hand set.	✓		low	low	low
2. Repeated reaching	• Telephone not positioned close to the body (See Figure 5.1) • Person dials frequently	43. Move telephone in work zone: • move telephone closer to body and into the primary work zone (see work zone specifications, modifications section); • move telephone so reaching is not required to dial the phone or access the hand set.	✓		low	low	low
3. Shrugging: working with the shoulders shrugged	• Rarely occurs	N/A					
4. Repeated arm forces	• Rarely occurs	N/A					

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Holding/ carrying materials	• Rarely occurs	N/A					
6. Cradling the telephone between the neck and shoulder	• Talking on the telephone (using a handset) while both hands are occupied (e.g., keying or doing paper work)	83. Provide telephone headset: • provide a selection of head set types to choose from (e.g., over-the-head, over-the-ear). 101. Use an available telephone headset	 ✓	✓	med low	med med	med med
7. Head bent down, up or neck twisted	• Number display and buttons on telephone are positioned flat	3. Angle telephone base slightly: • tilt the base slightly toward the person; • avoid angling the base too much to avoid causing a bent wrist while dialing.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Telephone too far away • Person tends to rest the wrist on the front edge of the phone while dialing	43. Move telephone in work zone: • move telephone closer to body and into the primary work zone (see work zone specifications, modifications section); • move telephone so reaching is not required to dial the phone or access the hand set.	✓		low	low	low
		96. Train proper keying style: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying ; • encourage person to avoid bending the wrists while resting the hands; • rest hands in lap or on arm rests while pausing.	✓		low	med	med
		67. Program macro keys to reduce keying: • provide speed dial functions for commonly used functions; • employ computer-based dialing for highly repetitive dialing.	✓		low	high	high

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. Repeated wrist movements	• Rarely occurs	N/A					
10. Repeated finger movements	• Person makes many phone calls and dials many number throughout the day	67. Program macro keys to reduce keying: • provide speed dial functions for commonly used functions; • employ computer-based dialing for highly repetitive dialing.	✓		low	high	high
		13. Incorporate health comfort strategies: – breath frequently – alternate tasks; – stretch; – take rest pause.	✓		low	med	med
11. Hyperextension of finger/ thumb	• Person has tendency to hyperextend the index finger while dialing	96. Train proper keying style: • encourage person to avoid extending fingers while keying; • encourage person to keep all of the fingers curled under and together.	✓		low	med	med
	• Use of a rotary phone	21. Install a push button phone: • provide a touch-tone phone.		✓	med to high	med	med
		67. Program macro keys to reduce keying:	✓		low	high	high

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		• provide speed dial functions for commonly used functions; • employ computer-based dialing for highly repetitive dialing.					
12. Hand forces	• Poor typing style (e.g., hit keys hard)	96. Train proper keying style: • encourage person to practice using as light a touch as possible on buttons.	✓		low	med	med
	• Keys stiff • Lack of appropriate tactile feedback (e.g., a "click")	22. Install push button phone: • provide a keypad which does not require excessive forces to actuate; • keys should provide adequate auditory and tactile feedback when pressed.		✓	med to high	med	med
		67. Program macro keys to reduce keying: • provide speed dial functions for commonly used functions; • employ computer-based dialing for highly repetitive dialing.	✓		low	high	high

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Hard edges	• Person tends to rest the wrist on the front edge of the phone while dialing • Front edge of phone has a hard edge	18. Install palm rest: • cover the hard edge with a small palm rest for frequent dialers. 67. Program macro keys to reduce keying: • provide speed dial functions for commonly used functions; • employ computer-based dialing for highly repetitive dialing.	✓ ✓		low low	med high	med high
14. Repeated forearm rotation	• Rarely occurs	N/A					
15. Leaning forward/no back support	• Chair arms interfere with moving chair closer	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation. 78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.	✓	 ✓	low to med med	low low	med low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Repeated bending	• Reaching for items too far from body  **Figure 5.2**	43. Move telephone in work zone: • move telephone closer to body and into the primary work zone (see work zone specifications, modifications section); • move telephone so reaching is not required to dial the phone or access the hand set.	✓		low	low	low
17. Lifting Forces	• Rarely occurs	N/A					
18. No foot support	• Rarely occurs	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or work surface presses into legs	• Rarely occurs	N/A					
20. Hard floor surfaces	• Rarely occurs	N/A					
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	Rarely occurs	N/A					
23. Glare	Glare reflects off of plastic phone cover	3. Angle telephone base slightly: • angling the base my eliminate the exposed glare; • if this is unsuccessful, remove plastic phone cover. 31. Lower light levels: • turn off task light; • 50-100 fc is an appropriate range of light levels for using a phone; • remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the assistance of appropriate technical assistance and the agreement of co-workers in the area; • provide alternative light fixtures for overhead lights (parabolic louver fixtures are recommended when computer work is the pre-dominant activity.) Note: this should also be performed by the appropriate personnel.	✓	✓	low low to med	low med	low med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
24. Light levels	• Rarely occurs	N/A					
25. Screen distance	• Rarely occurs	N/A					
26. Difficult to read	• Rarely occurs	N/A					

CASE STUDY - 6 Copying/Sorting	
TASK TITLE: Copying/Sorting	
Task Description:	Copying and sorting may involve the use of a cart, boxes of paper, photocopier and loose paper. Typical jobs in which copying and sorting is performed include (not necessarily limited to): • customer service • general administrative support • librarians
Job Performance Measures Most often impacted by Copying/Sorting:	Error rates, number of copies made.
Typical Employee Comments about Copying/Sorting:	Employees typically complain about discomfort and/or stiffness in the back/torso, legs/feet, hands/wrists, arms, and shoulders/neck.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Pulling copies from copier • Sorting paper into separate piles on work surface(piles away from work surface edge • Sorting shelves too high • Carrying boxes of photocopy paper	27. Locate sorting piles near work-surface edge. 32. Lower sorting shelves below shoulder height. 111. Use step stool to access high-level shelves. 104. Use cart to move boxes of photocopy paper.	✓ ✓ ✓ ✓		low low low low	low low low low	med med med med
2. Repeated reaching	• Shelves too high for sorting • Items used frequently not positioned close to the body	32. Lower sorting shelves below shoulder height. 111. Use step stool to access high-level shelves. 35. Move items into work zone. 64. Position body closer to work. 87. Raise the work surface: • place boxes or reams of paper at knuckle height; • provide a table to minimize reaching.	✓ ✓ ✓ ✓ ✓	 ✓	low low low low low med	low low low low low low	med low low low med med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. Shrugging: working with the shoulders shrugged	• Rarely occurs	N/A					
4. Repeated arm forces	• Pulling boxes of photocopy paper • Taking out stacks of photocopy paper from the photocopy boxes	95. Train proper body mechanics: • minimize reaching by positioning body as close to the load as possible; • minimize rushing and high speed movements.	✓		low	low	low
5. Holding/ carrying materials	• Carrying and holding photocopy paper box • Carrying stacks of paper	104. Use available cart to move boxes of photocopy paper. 73. Provide appropriate cart.	✓	✓	low med to high	low low	med med
6. Cradling the telephone between the neck and shoulder	• Rarely occurs	N/A					
7. Head bent down, up, or neck twisted	• Rarely occurs	N/A					

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Pushing book down to copy	95. Train proper body mechanics: • minimize awkward wrist postures.	✓		low	low	med
9. Repeated wrist movements	• Sorting paper into stacks • Handling paper  **Figure 6.1**	95. Train proper body mechanics: • minimize awkward wrist postures. 91. Rotate staff members between tasks. 88. Redesign job: • eliminate unnecessary document handling by combining tasks; • eliminate unnecessary activities.	✓ ✓ ✓		low low med	low low med	med med high
10. Repeated finger movements	• Rarely occurs	N/A					
11. Hyper-extension of finger/thumb	• Rarely occurs	N/A					
12. Hand forces	• Pulling copies from copier (using pinch grips) • Pinch grips sorting paper	95. Train proper body mechanics: • use both hands or use a full-hand grip whenever possible. 70. Provide adequate storage/ equipment:	✓	✓	low low to med	low med	low med to high

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	 **Figure 6.2**	• eliminate unnecessary items from storage in order to increase available space. • provide a copier designed to copy books 88. Redesign job: • eliminate unnecessary document handling by combining tasks; • eliminate unnecessary activities.		✓	low to med	med	med to high
13. Hard edges	• Rarely occurs	N/A					
14. Repeated forearm rotation	• Turning pages • Handling documents	88. Redesign job: • eliminate unnecessary document handling by combining tasks; • eliminate unnecessary activities.		✓	low to med	med	med to high
15. Leaning forward or poor lower back posture	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Repeated bending	• Shelves positioned too low	24. Kneel to access low level of photocopier.	✓		low	low	low
	 **Figure 6.3**	87. Raise work surface: • avoid lifting heavy items (e.g., boxes of copier paper) from floor level; • place heavy items on sturdy tables or shelves.	✓	✓	med	low	low
	• Reaching for items too far from body	26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓	✓	low to med	low	low
	 **Figure 6.4**	35. Move items into work zone.	✓		low	low	low
		54. Position body closer to work.	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Reaching for items too far from body	34. Move items closer to body: • for example, reduce or eliminate obstructions that prevent person from being closer to work.	✓	✓	low to high	med	med
		95. Train proper body mechanics/posture: • encourage person to keep the load as close to the body as possible while handling loads; • move as close to the load as possible before lifting.	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Lifting forces	• Handling heavy items while bent and/or reaching for boxes, stacks or paper or files	26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓	✓	low to med	low to med	med to high
		34. Move items closer to body: • for example, slide items closer to the edge of a table before lifting.	✓		low	low	med
		104. Use available cart to move boxes, files etc.: • handle heavy items on carts; • provide appropriate sized carts for handling items in confined spaces.	✓		low	low	med
		95. Train proper body mechanics: • encourage person to avoid rushing while handling items; • allow adequate time to perform the task safely.	✓		low	low	low
18. No foot support	• Rarely occurs	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or worksurface presses into legs	• Rarely occurs	N/A					
20. Hard floor surfaces	• Standing and walking on hard surfaces	110. Use proper footwear. 72. Provide anti-fatigue mats.	✓	 ✓	low med	low low	low low
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Rarely occurs	N/A					
23. Glare	• Rarely occurs	N/A					
24. Light levels	• Rarely occurs	N/A					
25. Screen distance	• Rarely occurs	N/A					
26. Difficult to read	• Rarely occurs	N/A					

CASE STUDY - 7 Drafting (CAD Systems):	
TASK TITLE: CAD Drafting	
Task Description:	CAD drafting involves the use of a tablet, keyboard, and standard-shaped mouse. The mouse fits into the palm activated by either a series of two or three buttons. The tablet is used in combination with the mouse and keyboard. The length of time drafting varies significantly for drafting tasks as well as the type of work that is typically performed. Information used for drafting typically comes from a hard copy (paper size varies). Typical jobs in which CAD drafting is performed include: • engineering • drafting
Job Performance Measures Most often impacted by CAD Drafting:	Error rates; number of drawings completed.
Typical Employee Comments about CAD Drafting:	Employees often comment on their concern over the repetitive nature of the mousing task on the tablet. Employees typically complain about discomfort and/or stiffness in the hands/wrists, arms, shoulders/neck, and head/eyes.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Tablet positioned too high  **Figure 7.1**	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • a footrest may be required to support the person's feet.	✓		low	low	low
		30. Lower keyboard tray or work surface: • set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard.	✓		low to med	low	med
	• Chair positioned too far away	33. Move chair closer to worksurface.	✓		low	low	low
	• Arms of chair interfere with moving chair closer  **Figure 7.2**	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med	low	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med to high	med	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Lack of a place to rest the hands  **Figure 7.3**	36. Move keyboard forward so forearms rest evenly on surface: • if worksurface is deep enough, this is simply a matter of pushing the keyboard back on the worksurface; • if the worksurface depth is restricted, providing this space would require using a different worksurface for computer work.	✓	✓	low med	low low	low low
	• Lack of leg clearance under desk	89. Remove clutter from under work surface.	✓		low	low	med
	• Mouse positioned too high  **Figure 7.4**	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the mouse; • a footrest may be required to support the person's feet. 30. Lower keyboard tray or work surface: • set the height of the mouse support surface so that the person's elbows are at the same height as the mouse.	✓ ✓	 ✓	low low to med	low low	low med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Mouse not positioned next to keyboard  **Figure 7.5**	63. Position mouse next to keyboard: • provide a worksurface that allows the mouse and keyboard to be placed side by side and at the same height; • position mouse and keyboard so the forearm can be rested on the worksurface while keying and mousing.	✓	✓	low to med	low	low
	• Keyboard tray used with tablet placed on desk.  **Figure 7.6**	17. Install larger keyboard tray: • replace the current keyboard tray with a tray which accommodates a mouse/input device and a keyboard.		✓	med	low	med
		49. Place keyboard and mouse on work surface: • provide a work surface which is large enough to support a keyboard and mouse.		✓	med	low	med
	• Items used frequently not positioned close to the body	35. Move item in work zone: • frequently used items should be placed close to the body.	✓		low	low	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Multiple input devices used (e.g. keyboard, mouse, digital tablet) • Input devices too far away from body	34. Move items closer to body: • prioritize the location of input devices based on frequency of use. • position the most frequently used input device so that the person does not have to reach or bend the wrist while using it.	✓		low	med	med
2. Repeated reaching	• Reaching for items too far from body  **Figure 7.7** • Multiple input devices used (e.g., keyboard, mouse, digital tablet) • Input devices too far away from body	35. Move items in work zone. 34. Move items closer to body: • prioritize the location of input devices based on frequency of use; • position the most frequently used input device so that the person does not have to reach or bend the wrist while using it.	✓ ✓		low low	low med	med med
3. Shrugging: working with the shoulders shrugged	• Keyboard too high	30. Lower keyboard tray or work surface: • set the height of the work surface so that the person's elbows are at the same height as	✓	✓	low to med	low	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		the keyboard.					
	• Chair positioned too low	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • a footrest may be required to support the person's feet.	✓		low	low	low
	• Drawer under work surface restricts chair height	71 Provide alternative work surface: • remove drawer;	✓		med	low	med
		• provide a workstation with no obstructions under the worksurface such as pencil drawers or structural brackets.		✓	med	med	med
	• Person has tendency to tense the shoulders while working	23. Incorporate health comfort strategies: • encourage the person to relax while working – breath frequently – alternate tasks – stretch – take rest pauses	✓		low	low	med
		95. Train proper body mechanics/posture: – encourage the person to let the shoulders drop down and relax while keying.	✓		low	low	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Repeated arm forces	• Rarely occurs	N/A					
5. Holding/ carrying materials	• Rarely occurs	N/A					
6. Cradling the telephone between the neck and shoulder	• Talking on the telephone (using a handset) while both hands are occupied (e.g., keying or doing paper work)	83. Provide telephone headset: • provide a selection of head set types to choose from (e.g., over-the-head, over-the-ear).		✓	med	med	med
		101. Use an available telephone headset.	✓		low	med	med
	• Monitor positioned too low.  **Figure 7.8**	59. Position monitor just below eye level: • raise the monitor; • monitor should be positioned such that the top of the screen is between 0-4” (0-10.16cm) below eye height; • use a monitor riser, CPU/hard drive, or other stable surface to position monitor at the correct height.	✓		low	low	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7. Head Bent down, up, or neck twisted	• Monitor and keyboard not aligned  **Figure 7.10**	61. Position monitor in front of body: • position monitor so that it is directly behind the keyboard; • this allows the body to be in alignment and prevents twisting of the neck;	✓		low	med	med
		• provide a worksurface that is deep enough to support the keyboard and the monitor screen. For large monitors, this indicates a worksurface which is at least 30" (76.2 cm) deep; • provide a worksurface that is large enough for computer and paper tasks; • use of keyboard trays and monitor support arms may be used in some situations, however, they often have unwanted side effects.		✓	med to high	med	med
	• Monitor greater than 30" inches from eye causes the person to lean forward to read monitor	34. Move items closer to body: • position monitor between 18" and 30" (45.72-76.2 cm) from eyes; • 22"-24" (55.88-60.96 cm) is a good distance for many people.	✓		low	med to high	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Uncorrected visual disorders cause the person to lean forward to read monitor or documents	6. Check eyes and correct for visual disorders: • encourage person to have visual disorders corrected.	✓		med to high	med to high	high
	• Individual wears bifocals	6. Check eyes and correct for visual disorders: • provide monofocal or tri-focal computer glasses.		✓	med to high	med	med
		59. Position monitor directly on the work surface: • for bifocal users, place monitor directly on the work surface or a bit higher so that the head is upright not tilted ensure that this does not cause glare problems. If it does, computer glasses are a better solution).	✓		low	low	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Working with large documents (e.g., large drawings and CAD print-outs).	4. Angle work surface to bring work closer to the body and the eye: • provide worksurfaces to support large documents; • drawings that are frequently moved or written on should be placed on an angled worksurface (like a drawing board); • drawings that are used for reference can be hung vertically; • the goal is to position the document in a more upright position and close to the monitor screen if it is used in conjunction with computer tasks.	✓	✓	low med	med med	med med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Keyboard/typewriter too high • Worksurface too high • Keyboard is above elbow height	30. Lower work surface/keyboard tray: • if the worksurface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • this is the preferred strategy because it doesn't require a foot rest.	✓	✓	low to high	low	med
		85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • This strategy is best when the worksurface is not easily adjustable in height; • a footrest may be required to support the person's feet.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Multiple input devices used (e.g. keyboard, mouse, digital tablet) • Input devices too far away from body	34. Move items closer to body: • prioritize the location of input devices based on frequency of use. • position the most frequently used input device so that the person does not have to reach or bend the wrist while using it.	✓		low	med	med
	• Keyboard/typewriter too low • Keyboard is below elbow height when chair height is adjusted so that the person's feet are flat on the floor	87. Raise keyboard or work surface: • if the worksurface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • if the worksurface is not adjustable in height, try raising the entire workstation with risers. This works best for free standing furniture but often does not work for modular furniture; • this is the preferred strategy because it doesn't require a foot rest.	✓	✓	low	low	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Keyboard is sloped towards the person	49. Place keyboard and mouse on worksurface: • lower the feet on the back of the keyboard; • adjust the keyboard support surface so the keyboard is flat and level.	✓		low	low	med
	• Person rests wrists on front edge of the keyboard or the work surface immediately in front of the keyboard	96. Train proper keying style: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying ; • encourage person to avoid bending the wrists while resting the hands when not keying.	✓		low	med	med
		18. Install palm rest: • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture;	✓		low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Leaning forward while keying or using the mouse	95. Train proper body mechanics: • encourage person to rest the back against the back rest while keying or using the mouse; this reduces the tendency to bend the wrists back while keying or using the mouse.	✓		low	med	med
	• Position of mouse in relation to keyboard	107. Use keyboard tray that accommodates mouse, keyboard, and palm support.		✓	low to med	med	med
	• Mouse is too far away from body  **Figure 7.11**	63. Position mouse next to keyboard: • position the mouse directly adjacent to the keyboard and at approximately the same height as the keyboard; • position mouse and keyboard so the forearm can be rested on the worksurface while keying and mousing.	✓		low	low	low
	• Using wrist movement to move mouse rather than arm movement	95. Train proper body mechanics posture: encourage person to use a forearm movement to move the mouse rather than a wrist movement.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. Repeated wrist movements	• Rarely occurs	N/A					
10. Repeated finger movements	• Mousing speed and length of task • Length of task without a work break	67. Program macro keys to reduce keying: • macros are small programs that can be useful for highly repetitive keying or mousing actions.	✓		low	high	high
		95. Train proper body mechanics posture: • Encourage the person to avoid rushing.	✓		low	low	low
		13. Incorporate health comfort strategies: - breath frequently - alternate tasks; - stretch; - take rest pauses.	✓		low	med	med
11. Hyper-extension of finger/thumb	• Small input device (e.g., track ball, glide point) requires single finger activation.	15. Install alternative mouse • provide a full-size input device such as a mouse or large track-ball.		✓	low to high	low	med

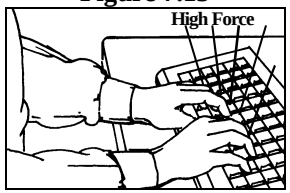
Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person has tendency to hyperextend fingers or thumbs while keying	98. Train proper mousing style: • encourage person to avoid extending fingers while mousing or keying; • encourage person to keep all of the fingers curled under and together.	✓		low	low	low
12. Hand forces	• Person tends to hit keys hard	96. Train proper keying style: encourage person to practice using as light a touch as possible on keys and buttons.	✓		low	low	low
	• Person tends to place a heavy grip on mouse or click mouse buttons hard	98. Train proper mousing style: • encourage person to practice keeping a light grip on the mouse.	✓		low	low	low
	• Keys are stiff	22. Investigate use of alternative keyboard: • provide a keyboard with keys which do not require excessive forces to actuate; keys should provide adequate auditory and tactile feedback when actuated.		✓	med to high	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Mouse buttons are stiff	15. Install alternative mouse: • provide a mouse with buttons which do not require excessive forces to actuate.		✓	med to high	med	med
	• Lack of appropriate tactile feedback (e.g., a "click")	22. Investigate use of alternative keyboard: • keys should provide adequate auditory and tactile feedback when actuated.		✓	low to high	med	med
		15. Install alternative mouse: mouse buttons should provide adequate auditory and tactile feedback when actuated.		✓	med to high	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Hard edges	• Wrists rest on edge of work surface (See Figures 7.12 and 7.13) **Figure 7.12**  **Figure 7.13** 	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • Note: in some cases, a footrest will be required in order to support the person's feet .	✓		low	low	low
		30. Lower keyboard tray or work surface: • set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard.	✓		low to med	low	med
		36. Move keyboard forward so forearms rest evenly on surface: • this reduces the tendency to rest the wrists/forearms on the hard edge;	✓		low	low	low
		• if the work surface depth is restricted, providing this space would require using a different work surface for computer work.		✓	med	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		18. Install palm rest: • the hard edge can be eliminated by attaching a rounded edge to the front edge of the work surface. This option is generally preferred over the use of a palmrest; • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; • a palm rest is only necessary if there is not another comfortable place to rest the hands without having to bend the wrists; • a palm rest is not recommended for a mouse because it results in awkward wrist movements.	✓		low	med	med
	• Work surface is not deep enough to provide a place to rest the hands in front of the keyboard	107. Utilize keyboard tray that accommodates mouse, keyboard, and palm support.		✓	high	med	med
		77. Provide larger work surface.		✓	med	med	med
	• Hard arm rests	94. Train worker to properly adjust chair: • attach padding to the armrests to eliminate exposure to hard edges.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		78. Provide proper chair • provide a chair with padded armrests		✓	med	low	low
14. Repeated forearm motion	Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward or poor lower back posture	• Monitor too far from eyes	58. Position monitor 18” - 30” (45.72-76.2 cm) from the eyes: • 22”-24” (55.88-60.96 cm) is a good distance for many people.	✓		low	med	med
	• Text is difficult to read	12. Improve character size and style on document and monitor: • increase font size of text; • font size of at least 12 point is recommended for screen distances of 18”-30” (45.72-76.2 cm); • font sizes of greater than 12 point are recommended for screen distances of greater than 30” (76.2 cm).	✓		low	med	med
	• Person has the unconscious habit of leaning forward while working	95. Train proper body mechanics: • encourage person to rest the back against back rest and sit back and relax while working; • encourage person to push his or her chair toward the workstation in order to reduce the tendency to lean forward.	✓		low	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Inappropriate chair adjustment	94. Train worker to properly adjust chair: • adjust back rest to support lower back; • pull chair forward and lean back while working; • attach a small pillow to back rest to support lower back.	✓		low	med	med
	• Inadequate chair	78. Provide proper chair: • provide a chair with a back rest; • provide a chair with adequate lower back support.		✓	med to high	med	med
	• Chair arms interfere with moving chair closer	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med	med	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med to high	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Seat pan on chair is too deep	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		low to med	med	med
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med
	• Inadequate foot support causes person to not lean against back rest • Chair too high causes person not lean against back rest	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item ; • a box or several ring binders taped securely together can also be used; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of 16” x 20” (40.64 cm X 50.8 cm) is recommended).	✓		low to med	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Working with large documents (e.g., large drawings and CAD print-outs)	4. Angle work surface to bring work closer to the body and the eye: • provide work surfaces to support large documents; • drawings that are frequently moved or written on should be placed on an angled work surface (like a drawing board); • drawings that are used for reference can be hung vertically; • the goal is to position the document in a more upright position and close to the monitor screen if it is used in conjunction with computer tasks.	✓		low to med	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Repeated bending	• Reaching for items too far from body  **Figure 7.14**	35. Move items in work zone.	✓		low	med	med
	• Working with large documents (e.g., large drawings and CAD print-outs)	4. Angle work surface to bring work closer to the body and the eye: • provide work surfaces to support large documents; • drawings that are frequently moved or written on should be placed on an angled work surface (like a drawing board); • drawings that are used for reference can be hung vertically; • the goal is to position the document in a more upright position and close to the monitor screen if it is used in conjunction with computer tasks.	✓		low to med	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Lifting forces	• Rarely occurs	N/A					
18. No foot support	• Chair too high	28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Feet are unsupported	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64 cm X 50.8 cm) is recommended).	✓		low to med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or work surface presses into legs	• Feet are not supported	76. Provide footrest: • a footrest can support the feet and simultaneously reduce pressure on the back of the leg; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64 cm X 50.8 cm) is recommended).  **Figure 7.15**	✓		low to med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Seat pan has a hard front edge	94. Train worker to properly adjust chair: • provide a cushion for the seat pan to prevent contact with hard edge.	✓		med	low	low
		78. Provide proper chair: • provide a chair with a rounded front edge on the seat pan.		✓	med to high	low	low
	• Seat pan too long	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		med	low	low
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Obstructions under work surface interfere with leg clearance and expose person to hard edges: – pencil drawers; – keyboard trays; – or structural supports.	89. Remove clutter from under work surface: • eliminate obstructions; • remove pencil drawers; • replace problem keyboard trays with trays that do not expose person to hard edges.		✓	low to high	med	med
20. Hard floor surfaces	• Rarely occurs	N/A					
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Length of work task without a change of position for the eyes	46. Periodically look away from screen. 13. Incorporate health comfort strategies: • encourage the person to relax while working – breath frequently – alternate tasks; – stretch; – take rest pause.	✓ ✓		low low	low low	low low
23. Glare	• Glare directly from a light source: looking towards an uncovered window • Glare from an uncovered window reflected off monitor or other shiny surfaces  **Figure 7.16** • Glare directly from a light	53. Place the monitor perpendicular to the window. 8. Close blinds or curtains: • provide window coverings if not available. 60. Position the monitor between	✓ ✓		low to med low	med med	med med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	source: looking towards an overhead light • Glare from an overhead or task light reflected off monitor or other shiny surfaces  **Figure 7.17**	rows of overhead lights: • position monitor so that no overhead lights are visible directly above the monitor when looking at the screen; • place the workstation so that it faces a wall or partition.		✓	low to med	med	med
		31. Lower light levels: • remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the assistance of appropriate technical assistance and the agreement of co-workers in the area.		✓	low to med	med	med
		20. Install parabolic louvers to direct light down on the surface: • provide alternative light fixtures for overhead lights (parabolic louvre fixtures are recommended when computer work is the pre-dominant activity.) Note: this should be performed by the appropriate personnel.		✓	high	med	med
		79. Provide screen hood/visor.	✓		low	med	med
		93. Tilt monitor down so that the screen is vertical.	✓		low	med	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Task light shines into eyes  **Figure 7.18**	9. Cover or turn out under-cabinet lighting: • cover the task light to prevent it from shining into eyes. 40. Move monitor out from under-cabinet lighting. 10. Direct task light away from screen and eyes: • if necessary, provide a more easily adjustable task light.	✓ ✓ ✓		low low low low	low low med low	low low med low

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
24. Light levels	• Light levels too high around monitor • Light level too low to read document	31. Lower light levels: • turn off task light; • 20-50 fc is an appropriate range of light levels for computer tasks; • remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the assistance of appropriate technical assistance and the agreement of co-workers in the area; • provide alternative light fixtures for overhead lights (parabolic louvre fixtures are recommended when computer work is the pre-dominant activity.) Note: this should also be performed by the appropriate personnel; • if light levels for the monitor are adjusted appropriately, it may still be necessary to increase light levels for paper tasks using a task light/desk lamp.	✓	✓	med to high	med	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		82. Provide task light: • provide task light (50-100 fc is an appropriate range of light levels for reading tasks); • increase overall light levels to meet the lighting needs of computer and paper tasks (50 fc is an appropriate light level where both computer and paper tasks are performed).		✓	low to med	med	med
25. Screen Distance	• Monitor positioned too close to eyes	58. Position monitor 18” -30” (45.72-76.2 cm) from the eyes: • 22”-24” (55.88 - 60.96 cm) is a good distance for many people.	✓		low	med	med
	• Not enough work surface space to position monitor far enough away from person	52. Place monitor on alternative work surface.		✓	med	med	med
	• Monitor positioned too far from eyes	58. Position monitor 18”-30” (45.72-76.2 cm) from the eyes: • 22”-24” (55.88 - 60.96 cm) is a good distance for many people.	✓		low	med	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Uncorrected visual disorders	6. Check eyes and correct for visual disorders: • provide computer glasses for person's who need bifocals, provide monofocal or tri-focal computer glasses.		✓	med to high	med	med
26. Difficult to read	• Font/character size too small to read on computer screen	12. Improve character size and style on document and monitor: • increase font size of text; • font size of at least 12 point is recommended for screen distances of 18"-30" (45.72-76.2 cm); • font sizes of greater than 12 point are recommended for screen distances of greater than 30".	✓		low	med	med
	• Document text too small	12. Improve character size and style on document and monitor:	✓		low	med	med
	• Document text is hand written or hard to ready	• increase character size.		✓	low to high	med	med
	• VDT screen dirty.	7. Clean screen regularly.	✓		low	med	med

CASE STUDY - 8 Filing/General Administrative	
TASK TITLE: Filing	
Task Description:	Filing and general administrative may involve the use of a cart, a computer and a stacks of files. Typical jobs in which filing is performed include (not necessarily limited to): • medical records • customer service • general administrative support
Job Performance Measures Most often impacted by Filing:	Error rates; number of files retrieved and replaced in the shelves.
Typical Employee Comments about Filing:	Employees typically complain about discomfort and/or stiffness in the back/torso, legs/feet, hands/wrists, arms, and shoulders/neck.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Pulling files above shoulder height	109. Use step stool to access high level shelves.	✓		low	low	med
		29. Lower items below shoulder height: • minimize handling of heavy or bulky items to and from overhead shelves; • for example, avoid placing heavy binders that are used frequently in overhead storage. Place these items on the regular worksurface or on a sturdy table or shelf.	✓		low	low	med
2. Repeated reaching	• Pulling/pushing/lifting items that are too low (below knee level)	87. Raise work surface: • avoid lifting heavy items (e.g., boxes of copier paper) from floor level; • place heavy items on sturdy tables or shelves.	✓	✓	low to high	med	med to high
		26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓		low to med	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		25. Locate frequently retrieved items between knee and shoulder height.	✓		low	med	med
	• Pulling/pushing/lifting items that are too high (above shoulder height) (see Figure 8.1)  **Figure 8.1**	29. Lower items below shoulder height: • minimize handling of heavy or bulky items to and from overhead shelves; • for example, avoid placing heavy binders that are used frequently in overhead storage. Place these items on the regular worksurface or on a sturdy table or shelf.	✓	✓	low to high	med	med to high
		26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓		low to med	low	low
		25. Locate frequently retrieved items between knee and shoulder height.	✓		low	med	med
		111. Use step stool to access high shelves.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Pulling/pushing/lifting items that are too far away from body	34. Move items closer to body: • for example, slide items closer to the edge of a table before lifting.	✓		low	med	med to high
		95. Train proper body mechanics/posture: • encourage person to keep the load as close to the body as possible while lifting/pushing/pulling; • move as close to the load as possible before lifting.	✓		low to med	med	med
3. Shrugging: working with the shoulders shrugged	• Rarely occurs	N/A					

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Repeated arm forces	• Pulling files requires high forces For example, shelves or files that are overstuffed can cause high forces to place and remove items.  **Figure 8.2**	104. Use available cart to move boxes, files etc.: • handle heavy items on carts.	✓		low to high	low	med to high
		95. Train proper body mechanics: • encourage person to avoid rushing while handling items; • allow adequate time to perform the task safely.	✓		low	low	low
		70. Provide adequate storage: • eliminate unnecessary items from storage in order to increase available space.		✓	low to med	low	med to high
		11. Group frequently used items together for convenient retrieval: • provide easy access for the most frequently used items by storing infrequently used items elsewhere.	✓		low	low	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Holding/ carrying materials	• Carrying and holding stacks of files  **Figure 8.3**	104. Use available cart to move boxes, files etc.: • handle heavy items on carts; • provide appropriate sized carts for handling items in cramped spaces.	✓	✓	low med	low med	med med
6. Cradling the telephone between the neck and shoulder	• Rarely occurs	N/A					
7. Head bent down, up, or neck twisted	• Rarely occurs	N/A					

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Rarely occurs	N/A					
9. Repeated wrist movements	• Placing files onto shelves and carts	95. Train proper body mechanics: • encourage person to maintain a straight wrist while handling items; • position body or item to improve wrist position while handling.	✓		low	low	low
10. Repeated finger movements	• Rarely occurs	N/A					
11. Hyper-extension of finger/thumb	• Rarely occurs	N/A					
12. Hand forces	• Pulling files requires high hand forces • For example, shelves or files that are overstuffed can cause high forces to place and remove items • Item is difficult to grasp and hold	95. Train proper body mechanics: • encourage person to avoid rushing while handling items; • allow adequate time to perform the task safely; • encourage person to use two hands to handle items whenever possible. 70. Provide adequate storage: • eliminate unnecessary items from storage in order to increase available space; • provide easy access for the most	✓	✓	low to high low to med	low med	med to high med to high

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		frequently used items by storing infrequently used items elsewhere. 113. Use well fitting gripper gloves to pull files.	✓		low to med	low	med
13. Hard edges	• Hard edges on boxes or files	113. Use well fitting gripper gloves to pull files.	✓		low to med	low	med
14. Repeated forearm motion	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward/no back support	• Items positioned too low on shelves (below knuckle height)  **Figure 8.4**	24. Kneel to access low level shelves.	✓		low to high	med	med
		87. Raise work surface: • avoid lifting heavy items (e.g., boxes of copier paper) from floor level; • place heavy items on sturdy tables or shelves.	✓		low to med	low	med
		26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓		low to med	low	low
		25. Locate frequently retrieved items between knee and shoulder height.	✓		low	low	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		95. Train proper body mechanics: • encourage person to use the legs rather than the back to bend;	✓		low	low	low
16. Repeated bending	• Reaching for items too far from body	34. Move items closer to body: • for example, reduce or eliminate obstructions that prevent person from being closer to work.	✓		low to high	med	med
		95. Train proper body mechanics/posture: • encourage person to keep the load as close to the body as possible while lifting/pushing/pulling; • move as close to the load as possible before lifting.	✓		low	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Lifting forces	• Handling heavy items while bent and/or reaching for boxes, stacks or paper or files	26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items;	✓		low to med	low to med	med to high
		• provide tables or storage between knuckle and elbow height for heavy items.		✓	low to med	low to med	med to high
		34. Move items closer to body: • for example, slide items closer to the edge of a table before lifting.	✓		low	low	low
		104. Use available cart to move boxes, files etc.: • handle heavy items on carts; • provide appropriate sized carts for handling items in confined spaces.	✓		low	low	med
		95. Train proper body mechanics: • encourage person to avoid rushing while handling items; • allow adequate time to perform the task safely.	✓		low	low	low
18. No foot support	• Rarely occurs	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or worksurface presses into legs	• Rarely occurs	N/A					
20. Hard floor surfaces	• Standing and walking on hard surfaces	110. Use proper footwear: • use shoes with comfortable, compressible soles. 72. Provide anti-fatigue mats: • provide an anti-fatigue mat for areas where persons stand for long periods of time.	✓		med to high	low	med
21. Kneeling/ squatting	• Shelves positioned too low	78. Provide proper chair: • provide a low rolling stool to allow person to sit while accessing low shelves.		✓	med to high	low	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Rarely occurs	N/A					
23. Glare	• Rarely occurs	N/A					
24. Light levels	• Rarely occurs	N/A					
25. Screen Distance	• Rarely occurs	N/A					
26. Difficult to Read	• Rarely occurs	N/A					

CASE STUDY - 9 Use of Calculator/Numeric Key Pad	
TASK TITLE: Use of Calculator/Numeric Key Pad	
Task Description:	Use of calculator or the numeric key pad may involve a traditional keyboard, calculator, or an adding machine. The length of task time varies significantly for calculating tasks. Information used for calculating typically comes from a hard copy (such as a file, single sheets, cards, or computer print outs). Typical jobs in which calculating is performed include (not necessarily limited to): • heavy data entry • finance • contracts
Job Performance Measures Most often impacted by Use of Calculator/Numeric Key Pad:	Error rates, number of records/documents processed
Typical Employee Comments about Use of Calculator/Numeric Key Pad:	Employees most often comment on their concern over the repetitive nature of the keying task. A great deal of media attention is given to keying and this seems to bring the employee attention here. Employees typically complain about discomfort and/or stiffness in the hands/wrists, arms and shoulders/neck.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Calculator too high	85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the calculator; • a footrest may be required to support the person's feet.	✓		low	low	low
		30 Lower tray or work surface: • set the height of the work surface so that the person's elbows are at the same height as the calculator.	✓		low to med	low	med
		35. Move item in work zone: • position calculator so that the forearm can be supported during keying.	✓		low	low	low
	• Calculator/numeric pad too far away from the body	34. Move item closer to body: • prioritize the location of items on the workstation according to frequency of use; • if the calculator is used with high frequency, it should be moved closer to the body.	✓		low	low	low
	• Chair positioned too far away	33. Move chair closer to work surface.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Arms of chair interfere with moving chair closer  **Figure 9.1**	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med	low	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med	low	low
	• Lack of leg clearance under desk	89. Remove clutter from under work surface.	✓		low	low	med
	• Reaching to retrieve paper tape record from calculator	34. Move item closer to body: • prioritize the location of items on the workstation according to frequency of use; • if the calculator is used with high frequency, it should be moved closer to the body.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Repeated reaching	• Holding up pages of a multi-page reference document	57. Position document on document support: • provide a mechanical holder for pages; • separate pages in document so that pages can be viewed one at a time; • investigate electronic storage of documents.	✓		low to med	med	med
3. Shrugging: working with the shoulders shrugged	• Rarely occurs	N/A					
4. Repeated arm forces	• Rarely occurs	N/A					
5. Holding/ carrying materials	• Rarely occurs	N/A					
6. Cradling the telephone between the neck and shoulder	• Rarely occurs	N/A					

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7. Head Bent down, up, or neck twisted	• Person tends to look at keys or calculator readout while using the calculator	96. Train proper keying style: • encourage person to practice looking at the document while keying (i.e., learn not to look at keys while typing.)	✓		low	med	med
		12. Improve character size and style: • provide an alternative calculator which has a read out which is easy to see.		✓	med to high	med	med
	• Document positioned flat on work surface	4. Angle work surface to bring work closer to the body and the eye: • if document is manipulated frequently or written on, an inclined work surface is preferred; • the inclined surface should be able to be moved easily and, preferably, adjustable in incline; • the inclined surface needs a stop at the bottom to hold papers; the inclined surface can be a purchased accessory or it can be made by taping several empty 3-ring binders together and taping a clip board or a piece of cardboard at the bottom to hold the papers.		✓	med to high	med	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Document is too far away or is too far to the side	34. Move items closer to body: • prioritize the location of items on the workstation according to frequency of use; • those items used frequently should be positioned closer to the body for easy access.	✓		low	low	low
	• Uncorrected visual disorders cause the person to lean forward to read documents	6. Check eyes and correct for visual disorders: • encourage person to have visual disorders corrected.	✓		med to high	med to high	med to high
	• Monitor and keypad not aligned	65. Position numeric pad in front of monitor.	✓		low	low	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Calculator too high • Work surface too high	30. Lower work surface/keyboard tray: • if the work surface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • this is the preferred strategy because it doesn't require a foot rest.	✓		low to med	low	med
		85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • This strategy is best when the work surface is not easily adjustable in height; • a footrest may be required to support the person's feet.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Keypad is sloped towards the person	49. Place keyboard and mouse on work surface: • adjust the keypad support surface so the keypad is flat and level; • this can be done by placing a stable object under one side of the keypad in order to level it.		✓	med	low	med
	• Person rests wrists on front edge of the calculator or the work surface immediately in front of the calculator	96. Train proper keying style: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying ; • encourage person to avoid bending the wrists while resting the hands.	✓		low	med	med
		18. Install palm rest: • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture;	✓		low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person constantly rests wrists on the wrist rest while keying	• a palm rest is only necessary if there is not another comfortable place to rest the hands without having to bend the wrists. 96. Train proper keying style: • encourage person to maintain straight wrists while keying; • encourage person to keep wrists free while keying; • encourage person to use an arm movement to move around on the keyboard rather than a wrist movement; • encourage person to avoid bending the wrists while resting the hands; • rest hands in lap or on arm rests while pausing.	✓		low	med	med
		18. Install palm rest: • a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture;	✓		low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Leaning forward while using keypad.	• generally, a palm rest which is approximately the same height as the keys will achieve this. 95. Train proper body mechanics: • encourage person to rest the back against the back rest while using the keypad; • this reduces the tendency to bend the wrists back while keying.	✓		low	low	med
9. Repeated wrist movements	• Rarely occurs	N/A					
10. Repeated finger movements	• Keying speed and length of task. • Length of task without a work break.	67. Program macro keys to reduce keying: • macros are small programs that can be useful for highly repetitive keying or mousing actions. 95. Train proper body mechanics posture: • encourage the person to avoid rushing.	✓ ✓		low low	high low	high med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		13. Incorporate health comfort strategies: – breath frequently – alternate tasks – stretch – take rest pauses 88. Redesign job: • adjust job activities to distribute keying activities through out the day; • break up continuous keying and mousing tasks with other types of tasks.	✓	✓	low low to med	med med	med med
11. Hyperextension of finger/ thumb	• Person has tendency to hyperextend fingers or thumbs while keying	98. Train proper mousing style: • encourage person to avoid extending fingers while mousing or keying; • encourage person to keep all of the fingers curled under and together.	✓		low	low	low
12. Hand forces	• Person tends to hit keys hard.	96. Train proper keying style: • encourage person to practice using as light a touch as possible on keys.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Keys are stiff	22. Investigate use of alternative keyboard: • provide a keypad with keys which do not require excessive forces to actuate.		✓	med to high	med	med
	• Lack of appropriate tactile feedback (e.g., a "click").	22. Investigate use of alternative keyboard: • keys should provide adequate auditory and tactile feedback when actuated.		✓	med to high	med	med
		15. Install alternative mouse: • mouse buttons should provide adequate auditory and tactile feedback when actuated.		✓	low to high	low	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Hard edges	• Wrists rest on edge of work surface (see Figure 9.2)  **Figure 9.2**	30. Lower work surface: • set the height of the work surface so that the person's elbows are at the same height as the calculator.	✓		low to med	low	med
		85. Raise chair: • set the height of the chair so that the person's elbows are at the same height as the calculator; • a footrest may be required to support the person's feet.	✓		low	low	low
		36. Move keyboard forward so forearms rest evenly on surface: • this reduces the tendency to rest the wrists/forearms on the hard edge.	✓		low	low	low
		18. Install palm rest: • the hard edge can be eliminated by attaching a rounded edge to the front edge of the work surface. This option is generally preferred over the use of a palm rest;	✓		low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Hard arm rests	• a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; 94. Train worker to properly adjust chair: • attach padding to the armrests to eliminate exposure to hard edges. 78. Provide proper chair: • provide a chair with padded armrests.	✓	✓	low med	low low	low low
14. Repeated forearm rotation	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward or poor lower back posture	• Text is difficult to read	12. Improve character size and style on document and monitor: • increase font size of text; • font size of at least 12 point is recommended for screen distances of 18”-30” (45.72-76.2 cm); • font sizes of greater than 12 point are recommended for screen distances of greater than 30” (76.2 cm).	✓		low	med	med
	• Person has the unconscious habit of leaning forward while working	95. Train proper body mechanics: • encourage person to rest the back against back rest and sit back and relax while working; • encourage person to push his or her chair toward the workstation in order to reduce the tendency to lean forward.	✓		low	low	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Inappropriate chair adjustment	94. Train worker to properly adjust chair: • adjust back rest to support lower back; • pull chair forward and lean back while working; • attach a small pillow to back rest to support lower back.	✓		low	low	low
	• Inadequate chair	78. Provide proper chair: • provide a chair with a back rest; • provide a chair with adequate lower back support.		✓	med	low	low
	• Chair arms interfere with moving chair closer	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation.	✓		low to med	low	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Seat pan on chair is too deep	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back; • provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.	✓		low to med	med	med
	• Inadequate foot support causes person to not lean against back rest • Chair too high causes person not lean against back rest	81. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item ; • a box or several ring binders taped securely together can also be used; • A footrest of one height may not be appropriate for all sized individuals or workstations (foot rests with several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of 16” x 20” (40.64 cm X 50.8 cm) is recommended).	✓		low to med	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; care must be given to ensure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
16. Repeated bending	• Reaching for items too far from body  **Figure 9.3**	35. Move items in work zone.	✓		low	low	med
17. Lifting forces	• Rarely occurs	N/A					
18. No foot support	• Chair too high	28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Feet are unsupported	76. Provide footrest: • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item or a box or several ring binders taped securely together; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of at least 16” x 20” (40.64 cm x 50.8 cm) is recommended).	✓		low to med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or work surface presses into legs	• Feet are not supported	76. Provide footrest: • a footrest can support the feet and simultaneously reduce pressure on the back of the leg.  **Figure 9.4** 28. Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓ ✓		low to med low	low low	low low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Seat pan has a hard front edge	94. Train worker to properly adjust chair: • provide a cushion for the seat pan to prevent contact with hard edge.	✓		low	low	low
		78. Provide proper chair: • provide a chair with a rounded front edge on the seat pan.		✓	med	low	low
	• Seat pan too long	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back; • provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.	✓		low to med	med	med
	• Obstructions under work surface interfere with leg clearance and expose person to hard edges: – pencil drawers; – keyboard trays; – or structural supports.	89. Remove clutter from under work surface: • eliminate obstructions; • remove pencil drawers; • replace problem keyboard trays with trays that do not expose person to hard edges.	✓		low	low	med
20. Hard floor surfaces	• Rarely occurs	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Length of work task without a change of position for the eyes	46. Periodically look away from screen/document.	✓		low	low	low
		13. Incorporate health comfort strategies: – breath frequently – alternate tasks – stretch – take rest pauses	✓		low	med	med
23. Glare	• Glare directly from a light source: looking towards an uncovered window • Glare from an uncovered window reflected off surfaces	8. Close blinds or curtains: • provide window coverings if not available.	✓		low to high	med	med
	• Task light shines into eyes  **Figure 9.5**	9. Cover or turn out under-cabinet lighting: • cover the task light to prevent it from shining into eyes; • replace under-cabinet lighting with an adjustable desk lamp.	✓		low	low	low
		40. Move monitor out from under-cabinet lighting.	✓		low	med	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
24. Light levels	• Light level too low to read document	82. Provide task light: • provide task light (50-100 fc is an appropriate range of light levels for reading tasks); • increase overall light levels to meet the lighting needs of computer and paper tasks (50 fc is an appropriate light level where both computer and paper tasks are performed).	✓		low to med	med	med
25. Screen distance	• Rarely occurs	N/A					
26. Difficult to read	• Document text too small • Document text hand written hard to read	12. Improve character size and style on document and monitor: • increase size of text on hard copy; • improve clarity of text on hard copy.	✓		low	med	med

CASE STUDY - 10 Lifting/pushing/pulling	
TASK TITLE: Lifting/pushing/pulling	
Task Description:	**Lifting, pushing and pulling** may involve the use of a cart, items of varying weights and sizes (such as boxes of paper, stacks or paper or files) and placement of items at varying heights and locations (floor/shelves or a work surface). Typical jobs in which lifting/pushing/pulling is performed include (not necessarily limited to): • office supplies and distribution • copying and sorting • general administrative support
Job Performance Measures Most often impacted by Lifting/pushing/pulling:	Error rates, number of items retrieved and distributed
Typical Employee Comments about Lifting/pushing/pulling:	Employees typically complain about discomfort and/or stiffness in the back/torso, legs/feet, hands/wrists, arms, and shoulders/neck.
Suggested Level II Analysis:	Biomechanical Lifting Analysis, NIOSH Analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Rarely occurs	N/A					
2. Repeated reaching	• Pulling/pushing/lifting items that are too low (below knee level)	87. Raise work surface: • avoid lifting heavy items (e.g., boxes of copier paper) from floor level; • place heavy items on sturdy tables or shelves.	✓		low	low	med
		26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓		low	low	med
		25. Locate frequently retrieved items between knee and shoulder height.	✓		low	low	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Pulling/pushing/lifting items that are too high. (above shoulder height) (see Figure 10.1)  **Figure 10.1**	29. Lower items below shoulder height: • minimize handling of heavy or bulky items to and from overhead shelves; • for example, avoid placing heavy binders that are used frequently in overhead storage. Place these items on the regular work surface or on a sturdy table or shelf.	✓		low	low	med
		26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓		low	low	med
		25. Locate frequently retrieved items between knee and shoulder height.	✓		low	low	med
		111. Use step stool to access high shelves.			low to med		

Shoulder/Neck

Job Factor	Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Pulling/pushing/lifting items that are too far away from body	34. Move items closer to body: • for example, slide items closer to the edge of a table before lifting. 95. Train proper body mechanics/posture: • encourage person to keep the load as close to the body as possible while lifting/pushing/pulling; • move as close to the load as possible before lifting.	✓ ✓		low low	med low	med med
3. Shrugging: working with the shoulders shrugged	• Rarely occurs	N/A					
4. Repeated arm forces	• Repetitive handling of heavy items • Items require high forces to remove and replace (e.g., shelves or files that are overstuffed can cause high forces to place and remove items)	104. Use available cart to move boxes or files: • handle heavy items on carts. 95. Train proper body mechanics: • encourage person to avoid rushing while handling items; • allow adequate time to perform the task safely. 70. Provide adequate storage: • eliminate unnecessary items	✓ ✓ ✓		low low low to high	med low low	med med med

Shoulder/Neck

Job Factor	Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		from storage in order to increase available space.					
		11. Group frequently used items together for convenient retrieval: • provide easy access for the most frequently used items by storing infrequently used items elsewhere.	✓		low	low	med
5. Holding/ carrying materials	• Carrying materials for long-distances. • Carrying heavy materials. • Carrying items in confined or tight spaces.	104. Use available cart to move boxes or files: • handle heavy items on carts; • provide appropriate sized carts for handling items in confined spaces.	✓		low	med	med
6. Cradling the telephone between the neck and shoulder	• Rarely occurs	N/A					
7. Head bent down, up, or neck twisted	• Rarely occurs	N/A					

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent Wrists	• Rarely occurs	N/A					
9. Repeated wrist movements	• Stocking shelves with items of various weights and sizes	95. Train proper body mechanics: • encourage person to maintain a straight wrist while handling items; • position body or item to improve wrist position while handling.	✓		low	low	med
10. Repeated finger movements	• Rarely occurs	N/A					
11. Hyper-extension of finger/thumb	• Rarely occurs	N/A					
12. Hand forces	• Repetitive handling of heavy items • Items require high forces to remove and replace. (e.g., shelves or files that are overstuffed can cause high forces to place and remove items) • Item is difficult to grasp and hold	104. Use available cart to move boxes, files etc.: • handle heavy items on carts. 95. Train proper body mechanics: • encourage person to avoid rushing while handling items; • allow adequate time to perform the task safely; • encourage person to use two hands to handle items whenever possible. 70. Provide adequate storage:	✓ ✓ ✓		low low low to	med low low	med med med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		• eliminate unnecessary items from storage in order to increase available space; • provide easy access for the most frequently used items by storing infrequently used items elsewhere.			high		
		113. Use well fitting gripper gloves to pull files.	✓		low to med	low	med
13. Hard edges	• Hard edges on boxes or files	113. Use well fitting gripper gloves to pull files.	✓		low to med	low	med
14. Repeated forearm rotation	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward/no back support	• Items positioned too low (below knuckle height)	87. Raise work surface: • avoid lifting heavy items (e.g., boxes of copier paper) from floor level; • place heavy items on sturdy tables or shelves.	✓		low	low	med
		26. Locate heavy items between knuckle and elbow height. • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓		low	low	med
		25. Locate frequently retrieved items between knee and shoulder height.	✓		low	low	med
		95. Train proper body mechanics: • encourage person to use the legs rather than the back to bend; • encourage person to arch the lower back while lifting.		✓	low	low	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Repeated bending	• Reaching for items too far from body (see Figure 10.2)  **Figure 10.2**	34. Move items closer to body: • for example, reduce or eliminate obstructions that prevent person from being closer to work.	✓		low	med to high	med
		95. Train proper body mechanics/posture: • encourage person to keep the load as close to the body as possible while lifting/ pushing/pulling; • move as close to the load as possible before lifting.	✓		low	low	med
17. Lifting forces	• Handling heavy items while bent and/or reaching for boxes, stacks or paper or files	26. Locate heavy items between knuckle and elbow height: • middle shelves on a storage shelf should be reserved for the heaviest items; • provide tables or storage between knuckle and elbow height for heavy items.	✓		low	low	med
		34. Move items closer to body: • for example, slide items closer to the edge of a table before lifting.	✓		low	med to high	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		104. Use available cart to move boxes, files etc.: • handle heavy items on carts; • provide appropriate sized carts for handling items in confined spaces.	✓		low	med	med
		95. Train proper body mechanics: • encourage person to avoid rushing while handling items; • allow adequate time to perform the task safely.	✓		low	low	med
18. No foot support	Rarely occurs	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or worksurface presses into legs	• Rarely occurs	N/A					
20. Hard floor surfaces	• Standing and walking on hard surfaces	110. Use proper footwear: • use shoes with comfortable, compressible soles; • provide an anti-fatigue mat for areas where persons stand for long periods of time.	✓		med	low	med
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Rarely occurs	N/A					
23 Glare	• Rarely occurs	N/A					
24. Light levels	• Rarely occurs	N/A					
25. Screen Distance	• Rarely occurs	N/A					
26. Difficult to read	• Rarely occurs	N/A					

CASE STUDY - 11 Microscope Work	
TASK TITLE: Microscope Work	
Task Description:	The type of microscope on which this case study is based is the traditional two eye-piece microscope with focus and adjustment controls. The length of time preparing and examining slides varies significantly for microscope tasks as well as the type of work that is typically performed. Typical jobs in which microscope work is performed include (not necessarily limited to): • hospital laboratories • environmental testing laboratories
Job Performance Measures Most often impacted by Microscope Work:	Error rates, number of slides examined and identified
Typical Employee Comments about Microscope Work:	Employees most often comment on their concern over the repetitive nature of microscope work. work. Employees typically complain about discomfort and/or stiffness in the hands/wrists, arms, shoulders/neck, and head/eyes.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	• Microscope/work surface too high	30. Lower work surface: • set the height of the microscope so that the microscope controls are about half way between resting elbow height and shoulder height.	✓		low	low	med
	• Chair positioned too low	85. Raise chair: • set the height of the chair so that the microscope controls are about half way between resting elbow height and shoulder height; • be sure to provide adequate support for the feet.	✓		low	low	low
	• Person reaches to write on document which is too far away on work surface	35. Move item in work zone: • move the document closer to the edge of the work surface; • items which are used every few minutes or more should be placed close to the body.	✓		low	med	med
	• Person does not rest the hand while writing	18. Install palm rest: • provide a place for the person to rest the hand while writing; • encourage the person to rest the hand while writing.	✓		low	low	low

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Chair positioned too far away	37. Move microscope closer to edge.	✓		low	low	low
	• Arms of chair or other obstructions interfere with moving chair closer  **Figure 11.1**	90. Remove or lower armrests: • remove or adjust armrests or obstructions if they prevent the person from moving close enough to the workstation. • attach armrests as extensions to the worksurface.	✓	✓	low to med	med	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med to high	med	med
	• Lack of leg clearance under desk	89. Remove clutter from under work surface.	✓		low	med	med
	• Items used frequently not positioned close to the body	35. Move item in work zone: • items which are used every few minutes or more should be placed closest to the body.	✓		low	med	med
2. Repeated reaching	• Items used frequently not positioned close to the body	35. Move items in work zone. • Provide foot controlled focusing mechanisms to reduce reaching associated with frequent control adjustments.	✓		low	med	med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		34. Move items closer to body: • prioritize the location of items on the workstation according to frequency of use; • those items which are more frequently used should be closer to the body and more easily accessible	✓		low	med	med
3. Shrugging: working with the shoulders shrugged	• Microscope too high	30. Lower work surface: • set the height of the microscope so that the microscope controls are about half way between resting elbow height and shoulder height.	✓		low	low	med
	• Chair positioned too low	85. Raise chair: • set the height of the chair so that the microscope controls is about half way between resting elbow height and shoulder height; • be sure to provide adequate support for the feet.	✓		low	low	low
4. Repeated arm forces	• Rarely occurs	N/A					
5. Holding/ carrying materials	• Rarely occurs	N/A					

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Cradling the telephone between the neck and shoulder	• Rarely occurs	N/A					
7. Head Bent down, up, or neck twisted	• Eye piece on microscope is too low	87. Raise the work surface: • set the height of the microscope so that the eye piece is at eye height. • change the eyepiece height to enable the worker to sit with the head upright.	✓	✓	low to med	low	med
	• Chair too high	28. Lower chair • set the height of the chair so that the work surface is about half way between resting elbow height and shoulder height	✓		low	low	med
	• Eye piece on microscope is at an inappropriate angle	4. Angle work surface to bring work closer to the body and the eye: • adjust the angle of the microscope; • provide a microscope with an adjustable eye piece.	✓	 ✓	low high	low med	med med

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Data recording sheets are positioned flat on work surface. (see Figure 11.2)  **Figure 11.2**	4. Angle work surface to bring work closer to the body and the eye: • if data collection sheet is manipulated frequently or written on, an inclined work surface is preferred; • the inclined surface should be able to be moved easily and, preferably, adjustable in incline; • the inclined surface needs a stop at the bottom to hold papers; • the inclined surface can be a purchased accessory or it can be made by taping several empty 3-ring binders together and taping a clip board or a piece of card board at the bottom to hold papers.	✓		med	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	• Microscope controls too high • Microscope controls are at an inappropriate angle	30. Lower work surface: • set the height of the microscope so that the microscope controls are about half way between resting elbow height and shoulder height.	✓		low to med	low	med
	• Chair is too low	85. Raise chair: • set the height of the chair so that the microscope controls is about half way between resting elbow height and shoulder height; • be sure to provide adequate support for the feet.	✓		low	low	med
		88. Redesign job: • break up continuous microscope tasks with other types of tasks.		✓	low to med	med	med
	• Person rests wrists on table while operating controls.	95. Train proper body mechanics posture: • encourage person to maintain straight wrists while using controls; • encourage person to keep wrists free while using controls; encourage person to avoid bending the wrists while resting the hands.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		14. Install adjustable forearm rests: • an arm rest can provide a comfortable place to rest the arms so that the worker doesn't need to rest on the wrists • build up the surface immediately under the controls so wrists rest on a surface without being bent.	✓		low	low	low
9. Repeated wrist movements	• Rarely occurs	N/A					
10. Repeated finger movements		88. Redesign job: • break up continuous microscope tasks with other types of tasks.		✓	low to med	med	med
11. Hyper-extension of finger/thumb	• Rarely occurs	N/A					
12. Hand forces	• Gripping the controls too hard.	96. Train proper body mechanics: • encourage person to practice using as light a grip as possible on the controls.	✓		low	low	low

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Hard edges	• Wrists rest on edge of work surface	18. Install palm rest: • the hard edge can be eliminated by attaching a rounded edge to the front edge of the work surface.		✓	low to med	low	low
		• a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture;	✓		low	low	low
		38. Move microscope forward so forearms rest evenly on surface: • this allow the person to minimize contact with a hard edge.	✓		low	low	low
	• Hard arm rests	94. Train worker to properly adjust chair: • attach padding to the armrests to eliminate exposure to hard edges.	✓		low	low	low
		78. Provide proper chair: • provide a chair with padded armrests.		✓	med to high	low	low
14. Repeated forearm rotation	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward or poor lower back posture	• Eye piece on microscope is too low	87. Raise work surface: • set the height of the microscope so that the eye piece is at eye height.	✓		low to med	low	med
	• Chair too high	28. Lower chair: • set the height of the chair so that the work surface is about half way between resting elbow height and shoulder height.	✓		low	low	med
	• Eye piece on microscope is at an inappropriate angle	4. Angle work surface to bring work closer to the body and the eye: • adjust the angle of the microscope;	✓		low	low	med
		• provide a microscope with an adjustable eye piece.		✓	high	med	med
	• Data recording document positioned flat on work surface.	4. Angle work surface to bring work closer to the body and the eye: • if document is handled, flipped or written on, an inclined work surface is preferred; • the inclined surface should be able to be moved easily and, preferably, adjustable in incline;	✓		med	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		• the inclined surface needs a stop at the bottom to hold papers; • the inclined surface can be a purchased accessory or it can be made by taping several empty 3-ring binders together and taping a clip board or a piece or card board at the bottom to hold the papers.					
	• Person has a habit of leaning forward while working	95. Train proper body mechanics: • encourage person to rest the back against back rest and sit back and relax while working; • encourage person to push his or her chair toward the workstation in order to reduce the tendency to lean forward.	✓		low	med	med
	• Inappropriate chair adjustment	94. Train worker to properly adjust chair: • adjust back rest to support lower back; • attach a small pillow to back rest to support lower back.	✓		low	med	med
	• Inadequate chair	78. Provide proper chair:		✓	med to	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		• provide a chair with a back rest; • provide a chair with adequate lower back support.			high		
	• Chair arms interfere with moving chair closer	90. Remove or lower armrests: • remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation. • attach auxiliary armrests as extensions to the worksurface.	✓		low to med	med	med
		78. Provide proper chair: • provide a chair in which the armrests can be adjusted or removed.		✓	med to high	med	med
	• Seat pan on chair is too deep	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back;	✓		low	med	med
		• provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med to high	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or foot ring on the stool; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
16. Repeated bending	• Reaching for items too far from body  **Figure 11.3**	35. Move item closer to body: • position items so they can be reached without leaning forward; • prioritize the location of items on the workstation according to frequency of use.	✓		low	med	med
17. Lifting forces	• Rarely occurs	N/A					
18. No foot support	• Chair too high	28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Feet are unsupported	76. Provide footrest: • adjust height of foot ring on chair (e.g., build up with wood, if not adjustable) • provide a footrest which allows both the heels and toes to be supported;	✓		low to med	low	low

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or work surface presses into legs	• Feet are not supported	76. Provide footrest: • adjust height of foot ring on chair (e.g., build up with wood, if not adjustable). • provide a footrest which allows both the heels and toes to be supported.	✓		low to med	low	low
		28 Lower chair: • adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; • care must be given to insure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms.	✓		low	low	low
	• Seat pan has a hard front edge	94. Train worker to properly adjust chair: • provide a cushion for the seat pan to prevent contact with hard edge.	✓		low to med	low	low
		78. Provide proper chair: • provide a chair with a rounded front edge on the seat pan		✓	med to high	med	med

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Seat pan too long	75. Provide back support: • attach a pillow to back rest to decrease the seat pan depth and support the lower back; • provide a chair with an adequate/adjustable seat pan depth and adequate lower back support.		✓	med	low	low
	• Obstructions under work surface interfere with leg clearance and expose person to hard edges: – pencil drawers; – or structural supports.	89. Remove clutter from under work surface: – eliminate obstructions – remove pencil drawers – move position of microscope (sideways) to eliminate interference with under-table obstructions.	✓	✓	low to med	med	med
20. Hard floor surfaces	• Rarely occurs	N/A					
21. Kneeling/ squatting	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	• Length of work task without a change of position for the eyes	45. Periodically look away from microscope to change the task demand on the eye and focus on an object of varying distance	✓		low	med	med
		13. Incorporate health comfort strategies: – alternate tasks – stretch – take rest pauses	✓		low	med	med
23. Glare	• Glare directly from a light source: looking towards an uncovered window	8. Close blinds or curtains: • provide window coverings if not available.	✓	✓	low	med	med
	• Task light shines into eyes	9. Cover or turn out under-cabinet lighting: • replace under-cabinet lighting with an adjustable desk lamp.		✓	low to med	med	med

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
24. Light levels.	• Light level too high or too low to use microscope	31. Lower light levels: • Equalize light levels entering "microscope eye" and eye exposed to room light.		✓	low to med	med	med
25. Screen distance	• Rarely occurs	N/A					
26. Difficult to read	• Detail difficult to see in microscope	12. Improve visibility: • provide a more powerful, better quality microscope;		✓	low	med	med